EXHIBIT R
SCENIC RESOURCES
OAR 345-021-0010(1)(R)

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APPENDICES

1.0 INTRODUCTION

OAR 345-021-0010(1)(r). *An analysis of significant potential impacts of the proposed facility, if any, on scenic resources identified as significant or important in local land use plans, tribal land management plans and federal land management plans for any lands located within the analysis area, providing evidence to support a finding by the Council as required by OAR 345-022-0080.*

Jordan Cove Energy Project, L.P., (Applicant) proposes to construct the South Dunes Power Plant (SDPP) in Coos Bay, Oregon. This Exhibit analyzes potential impacts from the SDPP to identified areas of significant visual or scenic quality, pursuant to OAR 345-022-0080(1). Exhibit B contains maps and figures depicting the facility layout and components.

2.0 METHODOLOGY

The analysis area used for this Exhibit includes the facility and an area 10 miles offset from the facility site boundary. After the site boundary was established, applicable federal and local planning and land use management documents pertaining to lands within the analysis area were reviewed to identify and map resources identified in those management plans as possessing significant or important visual qualities and values. Each resource identified during the document review is listed and discussed. Identified resources relative to the proposed facility and 10-mile analysis area boundary are mapped on Figure R-1.

To facilitate consideration and analysis of potential visibility of the SDPP from resources up to 10 miles away, an initial computer-based visibility analysis was performed to determine the Zone of Visual Influence (ZVI) for lands within the analysis area. The ZVI analysis used the SDPP site layout and focused on the tallest and most prominent features of the facility--the gas combustion stacks and the 115 kV power transmission corridor poles--which would have the highest likelihood of being seen from surrounding areas. That is, the ZVI established patterns of possible visibility for the tallest elements of the SDPP, and therefore represents the 'worse-case' scenario for visibility. For the purposes of this analysis, the stacks were assumed to have a top elevation of 165 feet and the power poles were assumed to have a top elevation of 163 feet.[1] Two air-cooled condensers were also included in the analysis, with a top elevation of 121 feet. Upon review of the ZVI results, identified scenic resources within the analysis that showed potential visibility in the ZVI modeling were carried forward for further investigation and analysis. Scenic resources from which the ZVI analysis indicated the facility structures would not be seen were identified but dismissed from further analysis.

The ZVI analysis results are mapped on Figures R-2 and R-3. The specific features of the proposed SDPP facility that were used in the ZVI analysis are shown on Figure R-5.

The ZVI analysis uses a combination of digital elevation modeling (DEM) and ESRI ArcGIS software. While useful as an analysis tool, the computer model does have limitations to note. It does not include vegetation cover, minor topography, distant landscape background, or structures. It represents line-of-sight results under a 'bare earth' condition. The patterns of potential visibility are therefore conservative because they overstate the potential for facility components to be seen. For example, the ZVI analysis may indicate that facility components would be seen from a given location, when in fact foreground tree cover or structures would limit views to the foreground and block views to the facility. In addition, the model does not factor in local weather conditions such as fog, haze seen across a distance, or humidity. Climatic conditions and their influence on limiting visibility are important factors in this location given that measurable precipitation occurs over 160 days of the year (as measured at the Southwest Oregon Region Airport in North Bend, Oregon). Given the predominance of evergreen forest cover and development within the analysis area, recent aerial photo interpretation was used in conjunction with the ZVI results to further understand visibility patterns from potential visual resources. An aerial photo with the identified resources depicted is shown on Figure R-4.

[1] All figures are feet above sea level.

Field investigations were conducted in 2013 to observe how the limiting factors of the ZVI analysis and aerial photo interpretation were borne out on the ground. Identified visual resources were visited and photos were collected from locations considered typical or representative of available views. Then, using selected photos collected during the field work, 3D-rendered visual simulations using current-design-based computer-modeling were created for several of the viewpoints at identified visual resources where it seemed possible from field observations that portions of the SDPP would be visible. These photos are attached as Appendix R-6. After the visual simulations were prepared, the Exhibit authors were able to compare existing conditions with the simulations for the selected locations in order to better understand the potential visibility of facility features and make determinations about the potential for visual impacts.

3.0 APPLICABLE FEDERAL, TRIBAL, AND LOCAL PLANNING GUIDELINES AND PLANS

OAR 345-021-0010(1)(r)(A). *A list of the local, tribal, and federal plans that address lands within the analysis area.*

The following plans address lands within the 10-mile analysis area:

- Oregon Dunes National Recreation Area (NRA) Management Plan 1994
- Final North Spit Plan 2006, An Update to the Coos Bay Shorelands Plan of 1995, BLM (BLM North Spit Plan)
- Coos Bay Shorelands Plan of 1995, BLM. This Plan was superseded by the Final North Spit Plan so analysis for this exhibit was based upon the BLM North Spit Plan.
- Coos Bay Estuary Management Plan, Coos County, 1975
- Coos County Comprehensive Plan
- City of North Bend Comprehensive Plan
- City of Coos Bay Comprehensive Plan 2000
- City of Lakeside Comprehensive Plan[2]
- Pacific Coast Scenic Byway Corridor Plan for US 101 in Oregon.

In addition, all of US Highway 101 within Oregon is classified as the "Pacific Coast Scenic Byway" by the Federal Highway Administration, the Oregon Department of Transportation, and the Oregon Tourism Commission for purposes of tourism promotion. Guidance for the management of this resource in Oregon is provided by the Pacific Coast Scenic Byway Corridor Management Plan for US 101 in Oregon (1997).

No tribal land management plans were identified pertaining to lands within the analysis area.

OAR 345-021-0010(1)(r)(B). *Identification and description of the scenic resources identified as significant or important in the plans listed in (A), including a copy of the portion of the management plan that identifies the resource as significant or important.*

Of the plans listed above for section (A), only the following plans specifically identify or discuss resources with scenic values: the Oregon Dunes NRA Management Plan; the BLM North Spit Plan; the Coos Bay Estuary Management Plan; Coos County Comprehensive Plan; City of Coos Bay Comprehensive Plan 2000; and the Pacific Coast Scenic Byway Corridor Plan for US 101 in Oregon.

[2] While the Lakeside Comprehensive Plan provides that the city will maintain an inventory of "natural, scenic, and historic resources," no such inventory has been developed. *City of Lakeside Comprehensive Plan, Volume II, adopted January 2014*, p. 6.

Table R-1 provides a summary of the important visual resources that were identified in the applicable management plans for this analysis, the specific plan which identifies each, and the distance and direction from each resource to the facility.

A description of the identified visual resources follows Table R-1, accompanied by more detailed information from the relevant management plan describing the scenic designation and policies guiding the management of each resource. Identified visual resources are mapped on Figure R-1.

Table R-1. Important Scenic Resources Identified in Applicable Federal and Local Management Plans that Pertain to Lands within 10 Miles of the Site Boundary

Scenic Resource	Managing Jurisdiction	Applicable Plan Identifying the Resource	Approximate Distance in Miles and Direction from Facility	Is SDPP Potentially Visible, Based on Computer Modeling?
Oregon Dunes National Recreation Area	USDA Forest Service	Oregon Dunes National Recreation Area Management Plan	0.75, north	Yes
BLM lands on the North Spit	BLM	BLM North Spit Plan of 2006	2.5, southwest	Yes
Coos Bay Estuary	Coos County	Coos Bay Estuary Management Plan, City of Coos Bay Comprehensive Plan 2000	Adjacent, south	Yes
Shore Acres State Park	Oregon State Parks and Recreation Department	Coos County Comprehensive Plan	10, southwest	Yes
Sunset Bay State Park	Oregon State Parks and Recreation Department	Coos County Comprehensive Plan	10, southwest	Yes
Gregory Point	Coos County	Coos County Comprehensive Plan	8, southwest	Yes
Yoakam Point State Natural Area/State Park	Oregon State Parks and Recreation Department	Coos County Comprehensive Plan	8, southwest	Yes
Coos Head	Coos County	Coos County Comprehensive Plan	7, southwest	Yes
Pacific Coast Scenic Byway/ US 101	ODOT	Oregon Dunes National Recreation Area Management Plan, Pacific Coast Scenic Byway	0.75, east	Yes

	Corridor Plan for US 101 in Oregon (1997)

3.1 OREGON DUNES NATIONAL RECREATION AREA

The nearest point of the SDPP is located about one mile from the Oregon Dunes National Recreation Area (NRA). Covering 31,500 acres and established by an act of Congress in 1972, the Oregon Dunes NRA was recognized as one of the largest temperate coastal sand dune areas in the world and is managed for "public outdoor recreation and enjoyment" and "for the conservation of scenic, scientific, historic, and other values contributing to public enjoyment." The NRA is administered by USDA Forest Service (USFS). Today, the NRA is a popular site for off-road vehicle (ORV) recreationists, but opportunities for hiking, wildlife viewing, horseback-riding, photography and camping are also available.

An excerpt from the Oregon Dunes NRA Management Plan (1994) is included as Appendix R-1, (p. III-8-9). As stated in the plan for the management of scenery, "primary viewsheds at the NRA are those seen from overlooks, roads and trails." Standards for managing these specified viewsheds are established by Visual Quality Objectives (VQOs), which describe the desired condition of the landscape viewed from these points, and how much visible modification from a natural, undeveloped condition is acceptable. VQOs range from 'preservation' to 'retention' to 'modification.'

Important scenic resources within the NRA identified in the plan and located within the 10-mile analysis area include:

- All trails
- Highway 101
- Horsfall [Beach] Road

The VQO established for all trails and Highway 101 is defined as 'retention,' which allows for slight alteration of the viewed area, although "to the average forest visitor, activities are not evident from the viewing location…Vegetation and landforms are used to screen facilities from unwanted views." 'Partial retention,' established for Horsfall Beach Road, calls for "management activities [that] are more apparent to the average forest visitor. These activities are visually subordinate to the natural landscape…" (USDA 1994, III-8, 9)

Nearly all trails within the analysis area are sand-surfaced, and offer views of exposed wind-sculpted sand dunes, small lakes, and coastal spruce and fir forest. Some high dune points offer views of the Pacific Ocean. Trails nearest the SDPP site within the analysis area include those south of Horsfall Beach Road, including Wild Mare Horse Trail and Bluebill Trail. Both trails are short (day-use length) and are located in areas closed for ORV use. Campgrounds are provided near trailheads for both trails. In addition, a short, accessible trail on an elevated boardwalk is located at the west end of Horsfall Beach Road, near the beach, and offers 360-degree views of the ocean, grassy foredune, and views up and down the coastline.

Overall, Highway 101 (also known as, the Pacific Coast Scenic Byway) in Oregon is over 350 miles long, joining the coastal highways of Washington and California, and is classified as an All-American Road by the Federal Highway Administration. Within the analysis area, Highway 101 traces the eastern edge of the NRA, offering westward views of sand dunes, lakes, and evergreen forest. Occasionally, drivers and cyclists along Highway 101 can also glimpse views of the Pacific Ocean.

Horsfall Beach Road is located off TransPacific Parkway, and is an access point to the NRA for ORV users but also provides a scenic driving or cycling route to the beach and equestrian camping areas. All areas south of Horsfall Beach Road are off-limits to ORV users, but areas to the north are dominated by open, rolling sand dunes and are popular with ORV riders. Multiple day-use staging areas and overnight camping areas with parking lots are located off Horsfall Beach Road. Views along the road are screened by adjacent vegetation, and mostly limited to the road corridor, although some brief views of Horsfall and Bluebill Lakes are available.

Although the plan addresses the management of scenery for areas not called out as primary viewsheds, no other specific important visual resources are identified.

3.2 BLM LANDS ON THE NORTH SPIT

The Final North Spit Plan (BLM, 2006) is sub-titled “an update to the Coos Bay Shorelands Plan of 1995.” Therefore, it is assumed to supersede the earlier plan and was treated as such for this analysis. The plan specifically discusses the 1,864 acres of BLM-owned and administered lands on the North Spit. The plan’s actions are in pursuance of its goal “to conserve the natural, cultural, and recreational values of the Spit.”[3]

The plan discusses visual resources specifically on page 59, and notes the “public lands on the south shore of the North Spit are a dominant visual resource element in the overall scenic backdrop of the Coos Bay estuary” (BLM, 2006). An excerpt of the plan is provided in Appendix R-2. The plan identifies BLM-owned lands on the Spit, and differentiates them into three ‘classes’ which the BLM utilizes for the purpose of visual resource management. The classes are used similarly by the BLM as VQOs are used by the USFS. That is, each class describes an acceptable level of visual change (or intrusion) to a purely natural landscape that may be visible from a given viewpoint. The classes range from I, ‘preservation’, to IV, which allows ‘major modification.’

The majority of the public lands on the spit are Class IV. However, the nearest parcel of BLM land to the SDPP site is located south of TransPacific Parkway and north of the SDPP utility corridor and is classified Class III, where the objective for visual resources management is to “partially retain the existing character of landscape.”[4] In addition, two undeveloped beach-front parcels slightly farther south along the Spit are designated Class II, where the objective is to “retain the existing character of the landscape.” Both of these parcels have ocean views to the west and are covered in dune grass and evergreen vegetation. Access is gained primarily by

[3] *Final North Spit Plan: An Update to the Coos Bay Shorelands Plan of 1995, p.5.*
[4] This 80 acre parcel is used informally by off-road vehicles, but otherwise it has no developed recreational facilities.

hiking from TransPacific Parkway or by ORVs along the sandy road following the foredune. Lastly, an easily-accessible and popular opportunity to take in views of Coos Bay exists at the BLM North Spit boat launch area, and this amenity is identified in the North Spit Plan. Features include a restroom building, boat launch ramp, and a large parking lot with broad views of the waters of Coos Bay as well as the city beyond.

3.3 COOS COUNTY RESOURCES

The Coos County Comprehensive Plan (dated 1985) discusses the value of scenic resources generally in Part I: Plan Provisions, and Part II: Inventories. In Part I, Chapter 5.9 provides the following goal: "Coos County shall value its identified outstanding scenic views and sites and shall strive to protect them where practicable." Strategies mentioned to implement this goal include the management of identified areas "so as to preserve their original character."

In Part II: Inventories, in pursuance of Statewide Planning Goal 5 (addressing scenic resources), Goal 17 (addressing coastal shorelands) and Goal 18 (addressing beaches and dunes), the Coos County Comprehensive Plan identifies several specific scenic resources that provide the "potential for exceptional coastal experience." Excerpt attached as Appendix R-8. Of those identified resources, the following fall within the analysis area: Shore Acres [State Park], Sunset Bay [State Park], Gregory Point, Yoakam Point [State Park], and Coos Head.

Shore Acres State Park is located 10 miles southwest of the SDPP site boundary. The park, a preserved residential estate, is situated on a rocky bluff overlooking the ocean and features an historic home and grounds, including several formally designed gardens and a trail leading to ocean front views. The park offers day-use activities such as hiking and picnicking. Sunset Bay State Park is located just to the north of Shore Acres, also about 10 miles from the SDPP site, and is situated around a small cove and beach at Sunset Bay. The beach is protected from strong surf by Gregory Point, a rocky promontory to the north of the beach. Sunset Bay State Park offers beach day-use, camping and hiking trails connecting to Shore Acres to the south.

Yoakam Point State Park is located north of Gregory Point, and is about 8 miles southwest of the SDPP site boundary. The site contains a wooded area and beachfront access and includes the rock formations of Yoakam Point, jutting into the ocean.

3.4 COOS BAY ESTUARY

The Coos Bay Estuary Management Plan is a component of the Coos County Comprehensive Plan. An excerpt is provided in Appendix R-3. The purpose of the plan is to "provide a complete use and management plan for the water and intertidal areas of the bay." Appendix 3 of that plan contains policies for carrying out the plan's purpose. Policy number 17 pertains to scenic resources, and contains the following language:

> # 17 "*Local governments shall protect from development, major marshes and significant wildlife habitat, coastal headlands, and exceptional aesthetic resources located within the Coos Bay Coastal Shorelands Boundary, except where exceptions allow otherwise.*
>
> I. *Local governments shall protect:*

d. *'Exceptional aesthetic resources' where the quality is primarily derived from or related to the association with coastal water areas."*

[*Appendix 3, Volume II Coos Bay Estuary Management Plan Policies, p.3-23 to 3-24]*

Within the analysis area, Coos County identifies Coos Head and its views of Coos Bay Estuary as an exceptional aesthetic resource. Coos Head is a promontory located due south of the entrance to Coos Bay. The US Navy operated a facility at the location between 1958 and 1987. Today, a small coast guard station operates at Coos Head, and a narrow road connects the spot to Cape Arago Highway to the south. The site is accessible to motorists, but it is not large enough to accommodate more than a few parked cars; a gravel turnaround near the coast guard station does offer dramatic views of Coos Bay and the jetties of the navigation channel entrance.

3.5 CITY OF COOS BAY RESOURCES

For the purpose of this analysis, two scenic resources were identified as significant by the City of Coos Bay: the waterfront areas of the city, and Coos Bay Estuary. An excerpt from the City of Coos Bay Comprehensive Plan is provided in Appendix R-4.

In the City of Coos Bay Comprehensive Plan, updated June 2010, the waterfront areas of the city are cited as "major scenic attractions."
[*City of Coos Bay Comprehensive Plan 2000, Volume 1, Part 1, Chapter 9, p.2*]

In its "Plan Inventories," the city identifies the Coos Bay Estuary as its largest and most prominent visual resource; therefore, for this analysis, it is carried forward as an important visual resource. While other natural features, such as Coos River, Isthmus Slough, and Catching Slough, among others, are also mentioned in the inventories as possessing visual quality, no special significance or guidelines for their management is provided. Therefore, these resources have not been carried forward for further consideration in this analysis.
[*Plan Inventories, City of Coos Bay Comprehensive Plan 2000, 1978, Volume II*]

3.6 US 101, PACIFIC COAST SCENIC BYWAY

Stretching over 300 miles along Oregon's coastal edge, US 101 is recognized by the Oregon Transportation Commission as a State Scenic Byway, and by the US Federal Highway Administration (FHWA) as an All American Road. In 1997, the *Pacific Coast Scenic Byway Corridor Management Plan for US 101 in Oregon* was developed to help guide and facilitate coordination among managing agencies to improve visitor experience and identify unique and important features along the route. An excerpt is attached as Appendix R-5.

As the plan states, "US 101 makes the colossal landscape of the Oregon Coast accessible. Treasured places are found in each of the [designated] regions…Its threading pavement ties together coastal communities and presents the world unequaled scenic and natural qualities."
[*Pacific Coast Scenic Byway Corridor Management Plan for US 101 in Oregon, 1997, Section 4, p.19]*

4.0 POTENTIAL IMPACTS ON SCENIC AND AESTHETIC RESOURCES

OAR 345-021-0010(1)(r)(C). *A description of potential significant adverse impacts to the scenic resources identified in (B), including, but not limited to, potential impacts such as:*

(i) Loss of vegetation or alteration of the landscape as a result of construction or operation;

The SDPP facility will be constructed at a site zoned for industrial use and formerly occupied by a Weyerhaeuser linerboard mill. The existing site is composed of large paved areas and an adjacent vacant area of sand covered with rough grass. Prior to construction, and as a component of a different project, the SDPP site will be excavated and covered with fill material, mainly sand, taken from the LNG facility site, proposed to be located west of the SDPP. Because of this fill material, there will be no vegetation on the proposed SDPP site prior to commencement of construction. Therefore, there will be no significant loss of vegetation or alteration of the landscape resulting directly from the installation of the SDPP.

Visual changes resulting from the presence of the SDPP facility are discussed below.

(ii) Visual impacts of facility structures or plumes.

A detailed analytical approach including computer modeling and digital visibility analyses, field investigations, and visual simulations from viewpoints within the analysis area were used to determine potential visual impacts from the proposed facility.

4.1 COMPUTER MODELING RESULTS

The results of the Zone of Visual Influence analysis are shown on Figure R-2. These results are helpful in considering potential patterns of visibility across a given landscape. However, in considering these results, it is important to note that the proposed facility would be located on private lands beyond the jurisdiction of the agencies managing public lands within the analysis area. Nonetheless, the Applicant will give consideration to mitigation strategies to avoid or minimize the effects of potential visual impacts, if any, where they are anticipated.

Photos of existing conditions and corresponding visual simulations created for this Exhibit show a current understanding of facility features and depict what could potentially be visible from a range of selected locations. These photos are provided in Appendix R-6 of this Exhibit.

4.2 DETERMINATION OF SIGNIFICANCE OF POTENTIAL IMPACTS

The Applicant proposes to dispose of heat from each power block using air-cooled condensers (ACCs) rather than an evaporative cooling tower. This method of cooling with ACCs does not produce a condensed water vapor plume; there will be no cooling towers or associated water vapor plumes.

Although the SDPP will not have a cooling tower which produces the bulk of plumes which are generally associated with power plants, the SDPP's combustion turbines with Heat Recovery

Steam Generators (HRSGs) will produce water vapor and under certain climatic conditions the water vapor will appear as a wispy translucent plume. An unavoidable exhaust byproduct of the combustion turbine electric generating process is the generation of water vapor.

With each pound of natural gas fired, over two pounds of water vapor are formed. Since the exhaust gas contains appreciably more water vapor than the ambient air, the vapor in the exhaust plume could condense and become visible under certain atmospheric conditions. A visible plume formed under such conditions is called a mixed vapor plume. When hot, humid exhaust gas is vented to a cooler humid atmosphere, the combination may be at or above the saturation level and a visible plume forms. This is similar to seeing one's breath on a cold morning. The atmospheric conditions under which a condensed combustion vapor plume would form are during cooler ambient temperatures, high relative humidity levels, and light winds.

A condensed vapor plume is generally indicated to be visible if it occurs during conditions which would allow it to be viewed by the general public. This definition normally excludes plumes being formed at night and during periods of inclement weather (rain, snow, or fog) that would obscure visibility. Such plumes, if formed, are often detached from the exhaust stack, and will form at some height above the stack outlet. The plumes are elevated above the ground, generally no more than about twice the stack height, and are typically wispy in nature and fairly rapidly dissipate and evaporate. Since condensed vapor plumes are always elevated they do not impact the ground level. The downwind distance for a condensed vapor plume is very dependent on the ambient relative humidity, such that if the relative humidity is approaching 100%, the condensed plume may be a hundred to several hundred feet downwind.

Given the factors described above, it is possible that a vapor plume would be infrequently and briefly visible, depending greatly on varying weather conditions and time of day. In general, plumes will be most likely to form and be seen early in the morning or during the night, and very rarely during the evening. More specifically, and based on plume studies performed for similar combined cycle generating facilities, condensed combustion vapor plumes will form for as many as 25% of the hours during a year, with 10% occurring during the early morning (dawn to mid-morning) with scant few occurring during the early evening (later afternoon to dusk); the remaining 15% occurring during the night.[5] That is, for the remaining 75% of hours during the year, no visible vapor plume will form. In Coos Bay, visible vapor plumes from the proposed SDPP occasionally may be observed at dawn but will dissipate and disappear once the sun rises and wind speed increases. Such plumes would be wispy and translucent in character. The most plausible locations the plume could be visible from include the waters of Coos Bay, and potentially from limited portions of the Oregon Dunes National Recreation Area. Due to the limited time that plumes would occur (only 25% of the hours during a year, with 10% occurring during early morning visible hours) and with the wispy translucent nature of the plume, the plumes would not constitute a significant impact on Visual Resources.

[5] Theodore Main, Principal Meteorologist and Condensed Combustion Plume Specialist, TRC Environmental Corporation.

Potential visual impacts from the facility, including its most prominent structures (gas combustion stacks and electrical transmission poles) are discussed for each identified important scenic resource described in response to subsection (B).

4.3 OREGON DUNES NATIONAL RECREATION AREA

The visibility analysis indicates that many portions of the proposed facility (i.e., exhaust stacks or electrical power poles) would be visible from many high-point areas within the Oregon Dunes NRA, including potentially Horsfall Beach Road. However, during field investigations, it was observed that throughout the Oregon Dunes NRA, views are frequently limited to the foreground by changeable sand formations, conifer forest cover, or a combination of these. Appendix R-6, Figure 6-1 shows existing conditions and a visual simulation at the Horsfall Beach Observation Area and campground, indicating that views of the facility structures would be blocked by nearby sand dunes covered in vegetation and conifer trees. A second visual simulation (Appendix R-6, Figure 6-7) was prepared for the area known as "Boxcar Hill," a tall sand dune adjacent to and south of the NRA with a large bald crest, located just north of the SDPP facility. Although this location is within private property, it is accessible from ORV tracks within the NRA, and recreationists may gain views of the SDPP from this vantage point. Observations during field investigations indicate that the area is commonly accessed by ORV riders.

While it is reasonable to assume that portions of the facility stacks or transmission poles may be intermittently visible from some portions of Oregon Dunes NRA, including higher dune tops, portions of some trails, and Horsfall Beach Road, these scenic resources have VQOs of 'retention' or 'partial retention.' The purpose of these VQOs is to manage vegetation removal and development activities while still allowing for some level of alteration of the natural landscape. Overall, while the SDPP facility may be visible from various locations within the NRA, it is not expected to result in significant adverse impacts to the scenic quality of the resource, because it is not expected that the features of the SDPP would dominate or overwhelm views of naturally present landforms or vegetation. Based on field observations, vegetation and sand formations limit the majority of views within trails and roads within the NRA to the immediate foreground.

4.4 BLM LANDS ON THE NORTH SPIT

Scenic resources within BLM-administered lands are inventoried and categorized into one of four visual resource classes, from Class One which calls for "total preservation of the existing landscape character" to Class IV which allows for "major modifications" to the character of the landscape by the inclusion of visually contrasting elements. As described under subsection (B), the BLM lands on the North Spit are predominately Class IV, but also include two parcels of Class III and two parcels of Class II. Map analysis and field investigations determined that views to the SDPP facility from the two identified Class II parcels would be far enough away (about five miles) and physically blocked from view by the beach foredune, undulating sand formations of the North Spit, and forest cover that the facility would not be visible from these areas. No adverse visual impacts to the BLM Class II parcels are expected.

Similarly, BLM Class IV lands are located at sufficient distance (two to three miles) and separated by sand dunes and forest cover such that visibility of the SDPP is likely to be infrequent and then include only portions of the facility, such as the tops of cooling stacks. Moreover, changes to views from within Class IV lands that include the facility contributing to a "major modification" of the landscape would not occur. Visual simulations of proposed conditions were prepared for two viewpoints for lands on the North Spit: first, the BLM boat launch, a popular and easily accessible facility within the Class IV BLM lands. From this location, the SDPP would be positioned behind the Roseburg woodchip facility, and mostly out of view (See Appendix R-6, Figure 6-4). For these reasons, visual impacts would not result on BLM Class IV lands on the North Spit.

The SDPP facility would be installed near lands of BLM Class III, and the overhead transmission lines from the facility run directly south of this area. The nearest Class III parcel is located about three-quarters of a mile west of the main SDPP, north of the utility corridor, and is directly south of the TransPacific Parkway. The parcel is somewhat isolated from the other BLM lands of the North Spit and does not provide ocean views. However, because of the proximity of the transmission line to the BLM land, a second visual simulation was created to indicate what could be seen from this location (see Appendix R-6, Figure 6-6). A dense wooded area stands between the Class III lands and the proposed power plant; therefore, looking from the BLM parcel east toward the power plant, views would be blocked by trees and vegetation. The Class III area comprised of open sand dune and low marsh would, however, have foreground views to the south of the proposed transmission line corridor and power poles. As the visual simulation shows, portions of two to three power poles and transmission lines may be visually silhouetted (therefore, visually apparent) against the sky, depending upon the position of the viewer. One power pole may be visible in its entirety from the open sandy areas of the BLM land. Despite these elements being visible, Class III does allow for visually contrasting elements in the landscape, so long as they remain visually subordinate to their surroundings. Since multiple tall power poles in the foreground may not be considered visually subordinate by all viewers in an otherwise somewhat scenic recreational setting, some visual quality loss may occur as a result of the transmission corridor at this location. However, existing industrial developments, a railroad, and the city of Coos Bay are also visible from this location. It is also important to clarify that the SDPP facility would be located on private industrial lands not owned or managed by the BLM, and therefore beyond the jurisdiction of the visual resource management guidelines employed by the BLM. Despite this, depending on the sensitivity of the viewer within the BLM land (mostly ORV users), seeing the power line in the foreground may constitute a moderate visual impact at this specific BLM parcel, when looking south.

Overall, the existing visual quality of BLM lands on the North Spit, including areas identified as possessing the relative highest scenic quality and managed to include the least visual contrast (Class II), would continue and be maintained. In addition, no visual impacts would result from the SDPP to the BLM boat launch. Some visual impact may result to one parcel of Class III BLM land, located between the TransPacific Parkway and the SDPP utility corridor. However, given the ability of the management Class to include contrasting elements, the isolated location of the BLM parcel, the level of development already visible from the parcel, and the variable degree of sensitivity viewers may have toward the power lines, the degree of visual impact would not be significant.

Still, an opportunity may exist to utilize power poles that would be as visually subordinate to the landscape as practicable to minimize their appearance, including aesthetic considerations for the poles' form, line, color, and finish. Using such techniques may eliminate the potential visual impact to the BLM Class III parcel.

4.5 COOS BAY ESTUARY

Computer modeling indicates that much of the North Slough would have views of the facility. See above for a detailed discussion of views from the North Spit. Modeling results for the North Slough appear to be false as they do not consider the forest cover that exists continuously along the western edge of the slough, which would block views looking toward the facility. Therefore, the SDPP would not result in visual impacts to the North Slough.

Boaters on Coos Bay would have views of the facility as they pass along it to the south. A visual simulation was created looking from the Southwest Oregon Regional Airport across Coos Bay toward the facility (See Appendix R-6, Figure 6-3). Boaters would have full views of the facility, but given that the Estuary is not explicitly managed for visual quality, SDPP would be located on industrial lands previously occupied by a linerboard mill, and the site is neighbored by an active wood chip terminal and power substation, views of the SDPP from Coos Bay would not result in adverse visual impacts to the Coos Bay Estuary.

4.6 SHORE ACRES STATE PARK

Computer modeling results indicating that views from some high points within Shore Acres State Park would include the proposed facility are likely false since the park is mostly wooded, and views would be limited to foreground forest vegetation. Shore Acres is also located about nine miles from the proposed SDPP site, and views to the north are blocked by the landforms of Gregory Point, which juts out into the ocean. Finally, established viewpoints within Shore Acres are focused on westward and southerly views of the Pacific Ocean or foreground scenery surrounding the formal gardens of an historic estate. That is, the dominant viewing locations within the park are not looking in the direction of SDPP. For these reasons, views of the SDPP facility are highly unlikely, and so no visual impacts would result at Shore Acres State Park.

4.7 SUNSET BAY STATE PARK

The computer modeling was inconclusive at this location, so it has been included for the sake of completeness. Sunset Bay State Park is also located about nine miles from the proposed facility. It consists of a small curving stretch of beach within a tiny cove between two tall rocky formations. No visibility of the proposed facility is anticipated, due to low elevation vantage point and distance. The proposed facility would not result in visual impacts at Sunset Bay State Park.

4.8 GREGORY POINT

Computer modeling indicates that some portions of Gregory Point would have views of the facility. The distance from Gregory Point to the proposed facility is about nine miles. However, map and aerial photo analysis show that the landscape between Gregory Point and the SDPP is largely covered with forested vegetation and undulating topography; therefore, actual view opportunities would be extremely limited. Focal points of view at Gregory Point include rocky bluffs jutting out into the ocean and Cape Arago Lighthouse. Because of the distance and unlikely opportunities to see the proposed facility, no visual impacts are expected at Gregory Point.

4.9 YOAKAM POINT STATE NATURAL AREA / STATE PARK

A small number of points in the computer modeling showed the potential for visibility from Yoakam Point, another promontory similar to Gregory Point. Yoakam Point is located about eight miles from the proposed facility. Views from here are focused mainly southward toward Gregory Point and the Cape Arago lighthouse on Chief's Island. There is little developed improvement at this site, and so opportunities to view from here are relatively limited. The site is covered with conifer forest vegetation. For these reasons, views of the proposed facility are extremely unlikely and therefore significant visual impacts would not result from the proposed facility.

4.10 COOS HEAD

The computer modeling shows some visibility of the SDPP may occur at Coos Head, just landward of the south jetty at the entrance to the Coos Bay navigation channel. The area is flat and mainly clear of vegetation. However, the distance from Coos Head to the proposed facility is approximately seven miles. Weather conditions such as fog or precipitation would have a strong influence over the viewer's ability to see across the distance and discern structures at the facility. Weather data collected at the Southwest Oregon Regional Airport indicates that Coos Bay receives over 160 days of measurable precipitation (0.01" or more) each year, and fog is prevalent, especially in the morning hours (ocs.oregonstate.edu, 2014). Even in fine weather, the facility would be in the far background, subordinate to the adjacent landscape and seeing it would not diminish the quality of middle ground and foreground views to the North Spit or lower Coos Bay. In addition, no specific visual guidelines or management criteria govern views from Coos Head. For these reasons, the SDPP facility would not result in significant visual impacts to Coos Head.

4.11 PACIFIC COAST HIGHWAY/US 101

A visual simulation was created to show potential visibility looking toward the facility from US Highway 101 where it crosses Coos Bay north of North Bend (See Appendix R-6, Figure 6-2). The distance to the facility in the simulation is about three-quarters of a mile, and represents the view when the facility would be the closest to viewers from Highway 101; that is, it represents a worst-case view from the resource. The simulation indicates that the stacks and other facility components would be visible on the far shore, and partially screened by vegetation along the shoreline bank. Although visible, the stacks remain visually subordinate in the overall scene because of the distance to Highway 101, and the background topography and forest cover of the sand dunes beyond, which help to visually ‘absorb’ the visible features into the landscape. The forested sand dunes seen behind the SDPP in the visual simulation are south of Oregon Dunes NRA about two to three miles west of the SDPP. The stacks are not seen silhouetted against the sky, which prevents them from appearing more visually noticeable and intrusive. For these reasons, the scenic qualities of Highway 101 over Coos Bay would not be impacted by the anticipated views of the SDPP. In addition, this view would be of only brief duration for viewers in moving vehicles or cyclists looking west as they cross the McCullough Bridge. This view would likely be obscured or limited altogether during foggy conditions or rainfall, and as mentioned above, rainy days are frequent in the area.

In the management plan that guides development along Highway 101, Pacific Coast Scenic Byway Corridor Plan for US 101 in Oregon (1997), the only provision for scenery is a limitation on billboards. Because the SDPP does not propose any billboards, and visibility of the facility would not negatively affect existing scenic views of Coos Bay from the roadway, significant visual impacts would not occur to US 101.

4.12 CONSTRUCTION

Construction of the SDPP facility is anticipated to last approximately 36 months. Construction activity will be visible to recreational users on Coos Bay, from very limited portions of the Oregon Dunes NRA and the North Spit BLM lands. Construction activities will also be visible to motorists using the Trans-Pacific Parkway and the Pacific Coast Scenic Byway (U.S. Highway 101). Visual effects from construction activities may include limited blowing dust or sand, visible presence of construction equipment, and component erection on the SDPP site. It is also possible that some nighttime construction may occur, in which case construction lighting of the site may be visible from locations with sight lines toward the project area, including Coos Bay, US Highway 101, and very limited portions of Oregon Dunes NRA and the North Spit. Lighting methods and a proposed lighting plan are attached as Appendix R-7. Visual effects from construction activities are anticipated to be intermittent and of temporary duration while construction is underway.

5.0 OPPORTUNITY FOR MITIGATION

OAR 345-021-0010(1)(r)(D). *The measures the applicant proposes to avoid, reduce or otherwise mitigate any significant adverse impacts.*

Although no significant adverse impacts to visual resources were identified through this analysis, the Applicant will incorporate best management practices to minimize the proposed facility's visual effects. Where a slight visual impact is possible at the BLM parcel on the North Spit, mitigation strategies to reduce the apparent visual contrast of the transmission poles could include using poles with an unobtrusive, non-shiny finish, such as matte coating, that harmonizes with background materials.

In addition, the following measures could be incorporated into the facility design and construction activities to maximize its unobtrusive integration into the visual environment of its location. Measures to control blowing dust and sand will be implemented during all construction activities involving ground disturbance at the project construction site. Ultimately, the use of native plants for restoration and stabilization of the sandy soil will also be incorporated into the final design. See Exhibit I for more details on soil management.

Only lighting required for operation and maintenance, safety, security, and to meet Federal Aviation Administration (FAA) requirements will be used on the site. Lighting will be localized to minimize off-site effects. See Appendix R-7 for more detailed discussion on proposed site lighting and methods for preventing lighting from the proposed SDPP from resulting in visual intrusions or impacts to adjoining areas.

Proposed structures will be painted with low-glare paint, and colors will be chosen to best complement the surrounding landscape foreground and background colors. Except for lighting used for safety and potentially FAA warning, night lighting fixtures and mounting will be selected to guide light downward, utilizing cutoff components, helping to minimize lighting and illumination seen from off the site.

6.0 MAP

OAR 345-021-0010(1)(r)(E). *A map or maps showing the location of the scenic resources described under (B).*

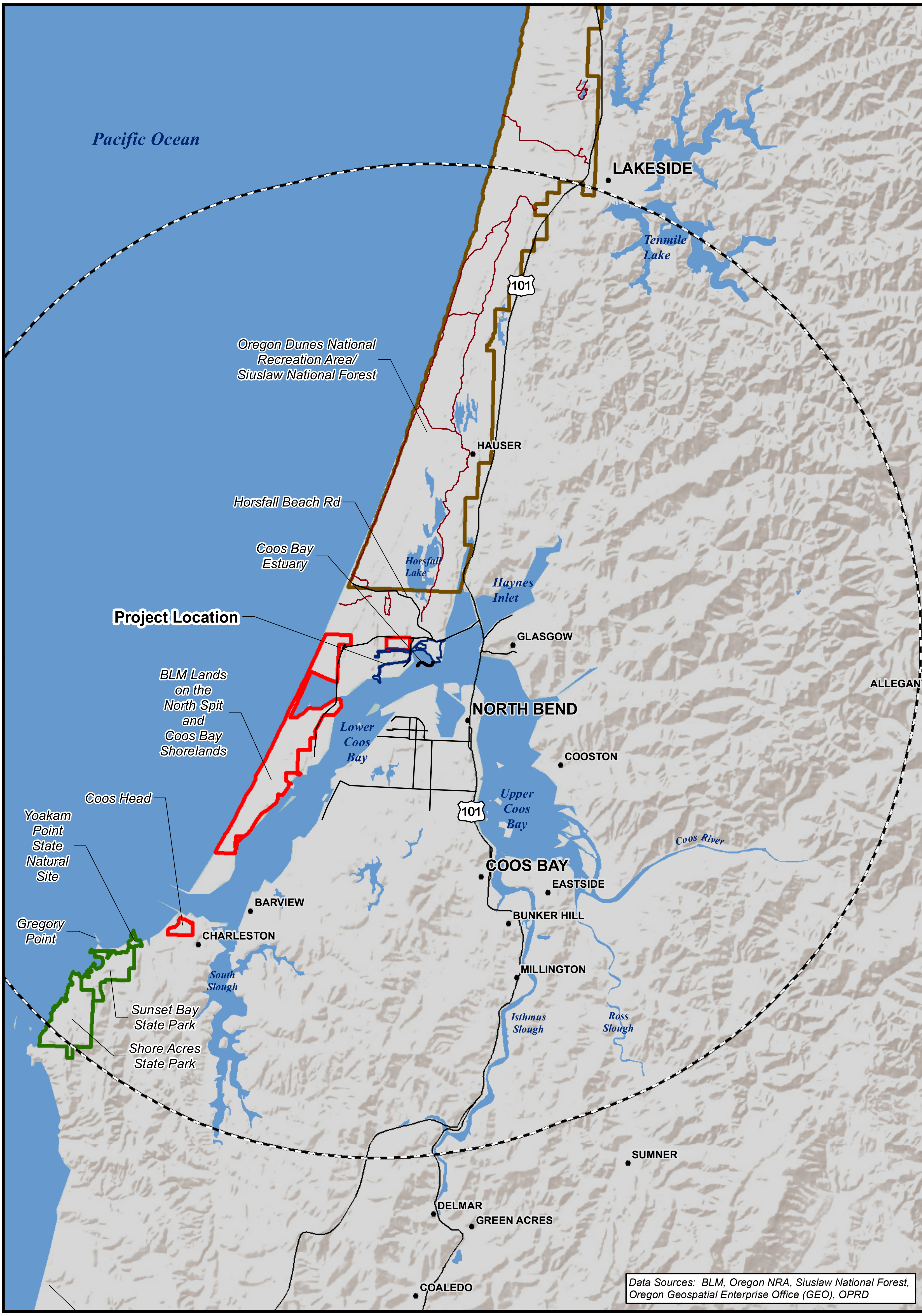
A map showing the location of the scenic resources is shown on Figure R-1. The zone of visual influence computer analysis results are mapped on Figure R-2 and R-3. Figure R-4 is an aerial photo interpretation of the identified visual resources. Figure R-5 indicates the location of components of the SDPP that were used in the ZVI analysis.

7.0 MONITORING

OAR 345-021-0010(1)(r)(F). *The applicant's proposed monitoring program, if any, for impacts to scenic resources.*

No significant adverse impacts to identified scenic resources were determined, so monitoring is not required. However, certain aspects of the SDPP development would require monitoring to ensure improvements are implemented as intended. Two of these that could affect views of the SDPP include site landscaping and erosion control. Landscaping will be monitored as required to ensure that plants grow as intended. Plants that fail to thrive will be replaced. Measures to control blowing dust and/or sand will be in place until the plants take hold sufficiently to ensure that soils stay in place. These measures include watering, fencing, and soil stabilization. These monitoring plans will be furthered codified in the Applicant's Storm Water Management Plan and Erosion and Sediment Control Plan (1200-C) which will be approved by the Oregon Department of Environmental Quality and are described in a conceptual plan attached to Exhibit I, Appendix I-4.

Figure R-1. Identified Visual Resources



N

0 1 2 Miles

1 inch = 2 miles

EFSC Site Boundary
Analysis Area (10 mile buffer from EFSC Site Boundary)
USFS Trail
Federal Land
State Land
BLM Land

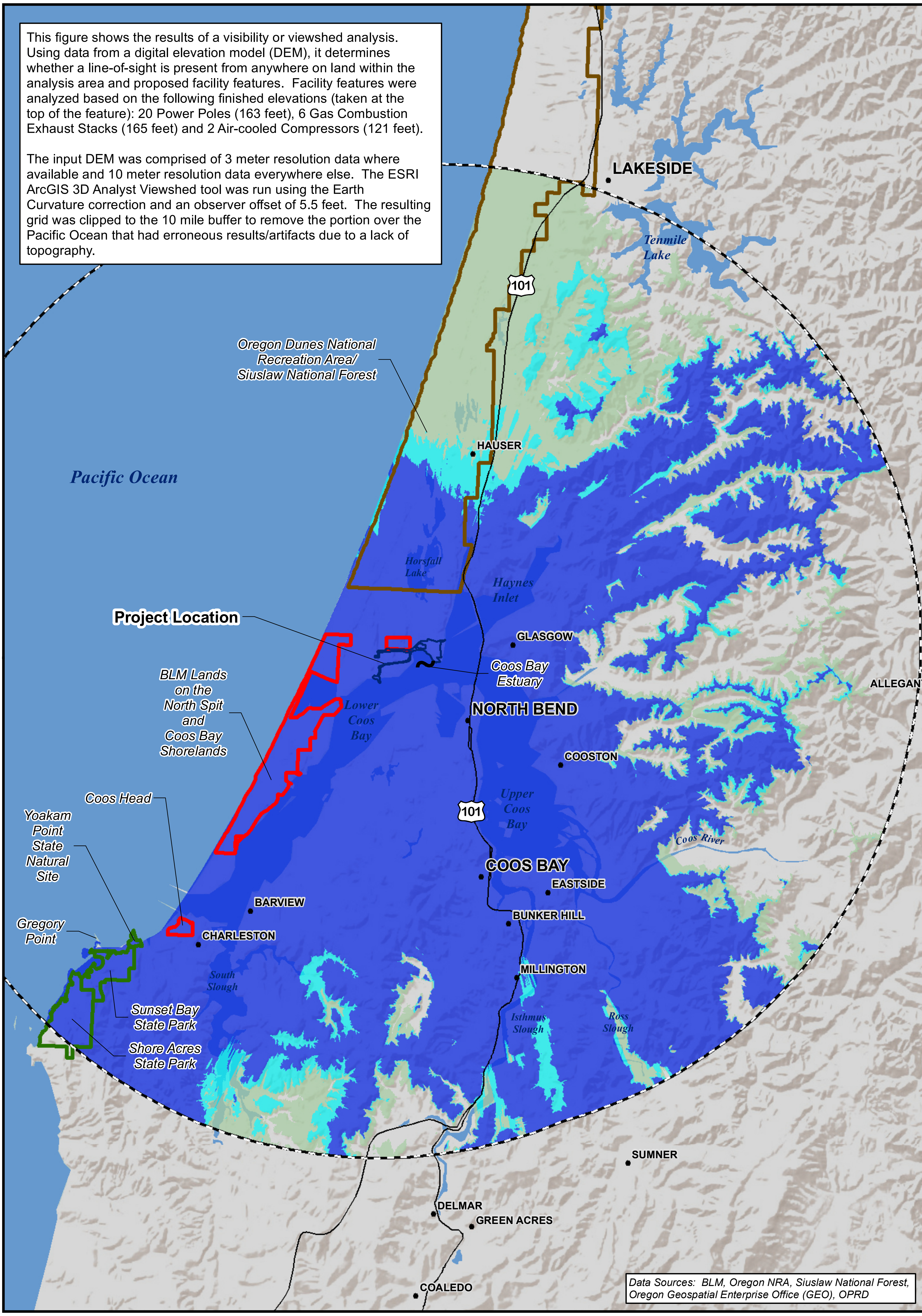
South Dunes Power Plant Project

EFSC Application

EXHIBIT R
Figure R-1
Identified Visual Resources

Date: 9/23/2014
Reviewed By BR
Designed By SAST

Figure R-2. Identified Visual Resources: ZVI



N

0 1 2 Miles

1 inch = 2 miles

- EFSC Site Boundary
- Analysis Area (10 mile buffer from EFSC Site Boundary)
- Federal Land
- State Land
- BLM Land

Features Visible

- 1 to 5
- 5 to 10
- >10

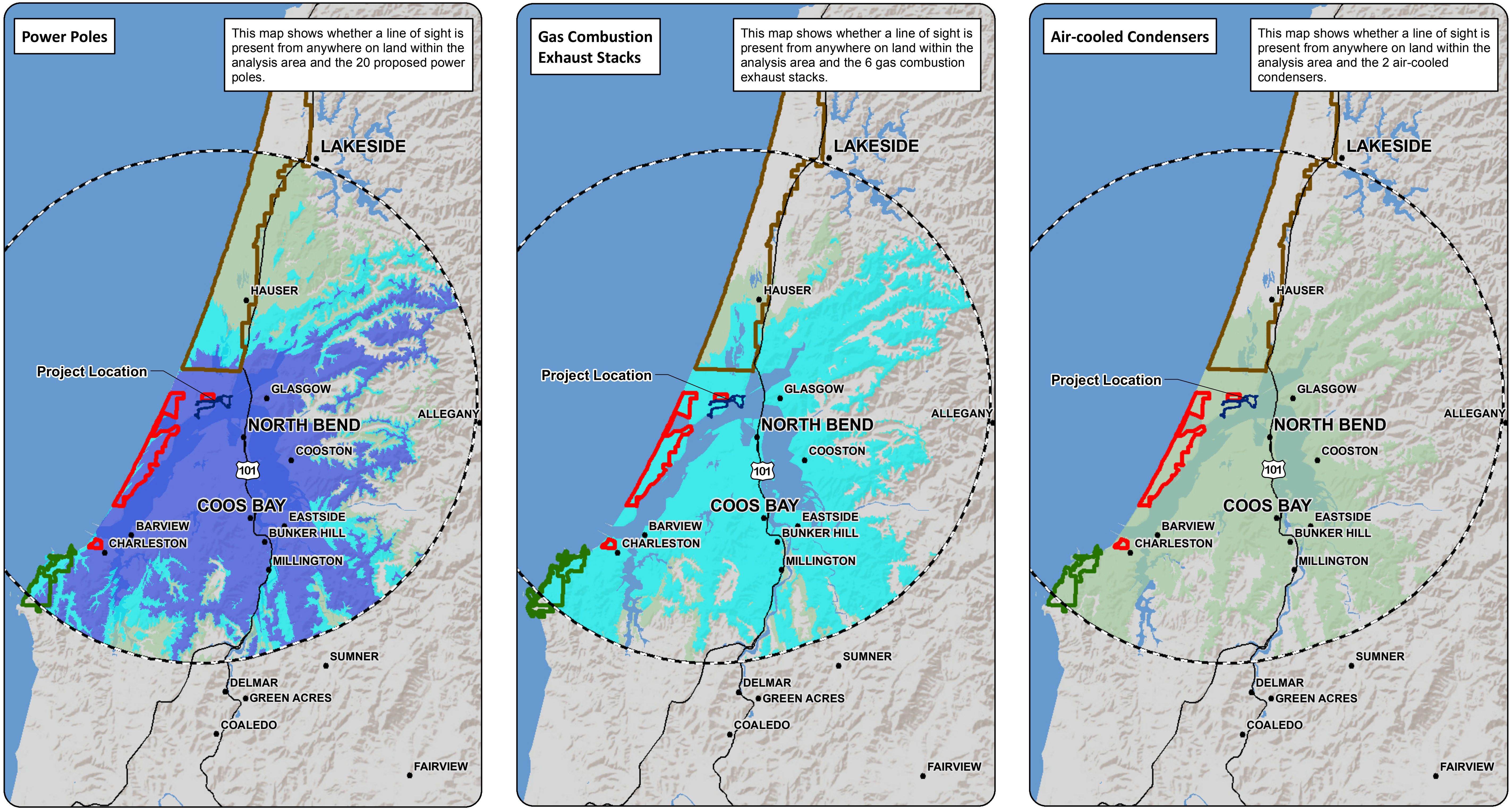
South Dunes Power Plant Project

EFSC Application

EXHIBIT R
Figure R-2
Identified Visual Resources:
ZVI

Date: 9/22/2014
Reviewed By BR
Designed By SAST

Figure R-3. Zone of Visual Influence by SDPP Feature Type



0 1 2 4 Miles

N

1 in = 4 miles

EFSC Site Boundary

Analysis Area (10 mile buffer from EFSC Site Boundary)

Federal Land

State Land

BLM Land

Features Visible

1 to 5

5 to 10

>10

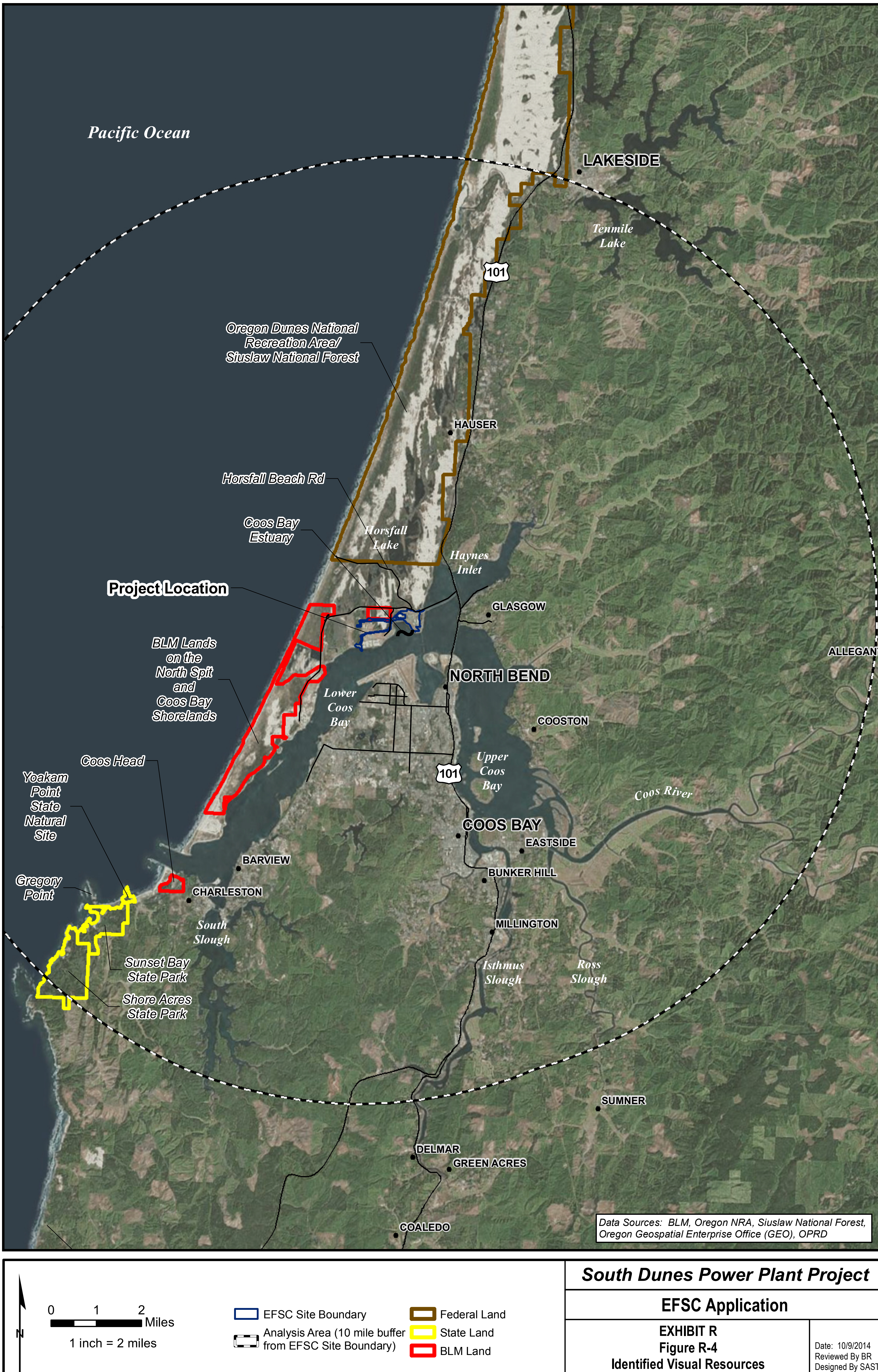
South Dunes Power Plant Project

EFSC Application

EXHIBIT R
Figure R-3
Zone of Visual Influence by SDPP Feature Type

Date: 9/22/2014
Reviewed By BR
Designed By SAST

Figure R-4. Identified Visual Resources: Aerial Photo Interpretation



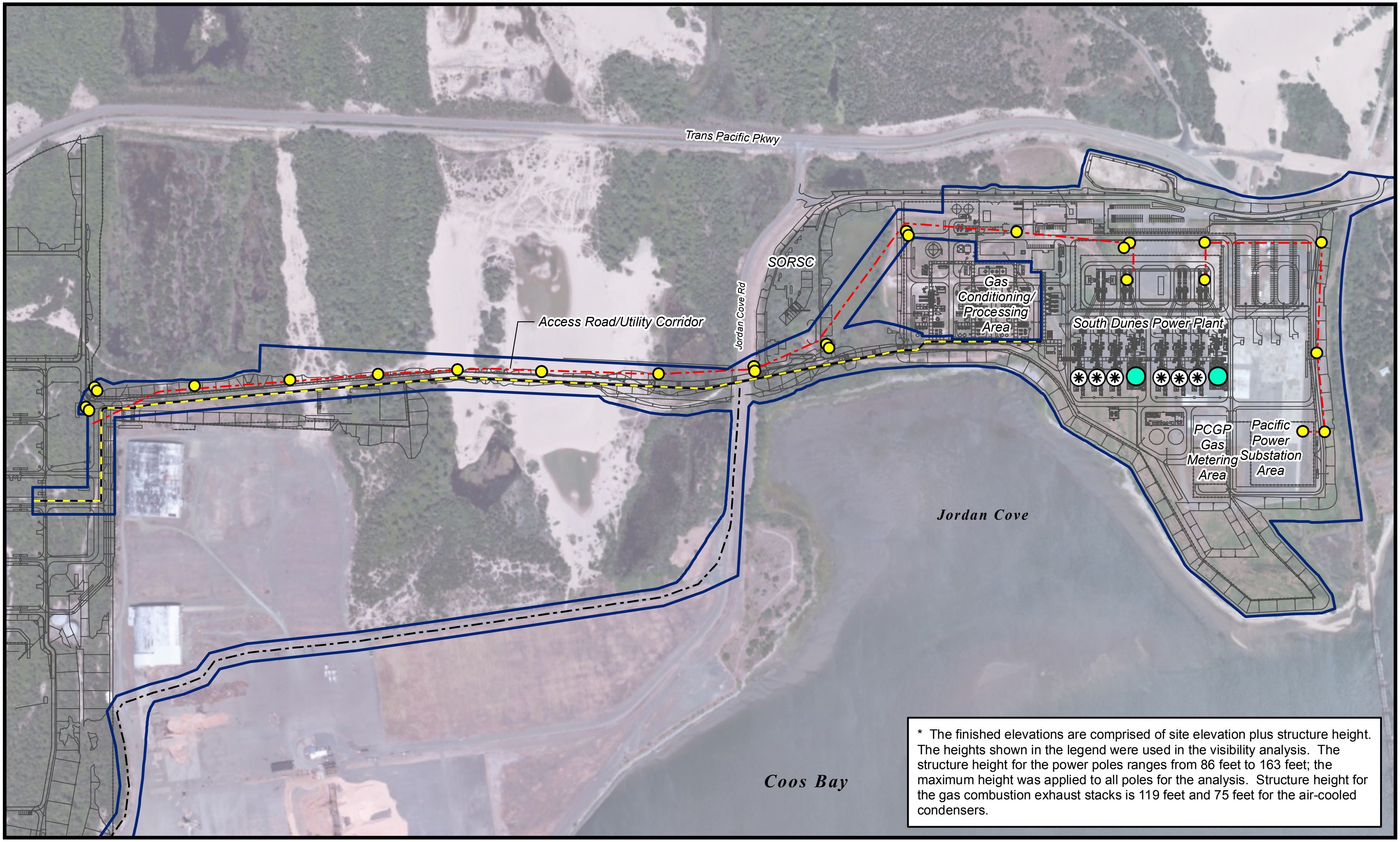
South Dunes Power Plant Project

EFSC Application

EXHIBIT R
Figure R-4
Identified Visual Resources
Aerial Photo Interpretation

Date: 10/9/2014
Reviewed By BR
Designed By SAST

Figure R-5. Visibility Analysis Feature Locations



* The finished elevations are comprised of site elevation plus structure height. The heights shown in the legend were used in the visibility analysis. The structure height for the power poles ranges from 86 feet to 163 feet; the maximum height was applied to all poles for the analysis. Structure height for the gas combustion exhaust stacks is 119 feet and 75 feet for the air-cooled condensers.

N

0 375 750 Feet

1 inch = 750 feet

- EFSC Site Boundary
- Power Pole
- Gas Combustion Exhaust Stack (165 feet)*
- Air-cooled Condenser (121 feet)*
- Heavy Equipment Truck Haul Road Centerline
- Gas Pipeline
- Overhead Power Transmission Line (115kV)

South Dunes Power Plant Project

EFSC Application

EXHIBIT R
Figure R-5
Visibility Analysis Feature Locations

Date: 9/22/2014
Reviewed By BR
Designed By SAST

APPENDIX R-1

Oregon Dunes National Recreation Area Management Plan (excerpt)

Public Safety

- Non-street-legal ORV operation is prohibited on NRA roadways intended for highway vehicle use.

- Non-street-legal ORV use is prohibited in developed facilities without direct sand access (Waxmyrtle, Lagoon, and Bluebill campgrounds). Some additional facility construction is planned to replace some of the capacity lost due to this restriction.

Conflicting Use Separation

- To reduce use conflicts, ORV use is prohibited in some previously open facilities (Siltcoos and South Jetty first beach parking lots). Some additional facility construction is planned to replace some of the capacity lost due to this restriction.

- Close Waxmyrtle Road.

- Seek changes in vehicle access along NRA beaches from the State of Oregon. Seek vehicle closure on beach south of Horsfall Road to Forest boundary and on beach south of Siltcoos River to one mile north of Threemile Road. Seek limitation to street-legal Class-II vehicles and ORVs only for handicapped access on North Spit Umpqua beach and on seasonally open beach north of South Jetty Road to Siuslaw River (see Plan Map).

Management of Scenery

Scenery is managed by establishing visual quality standards for all NRA lands. Projects and management activities are then planned to meet these standards, called Visual Quality Objectives (VQOs). VQOs describe the desired condition of the landscape and how much landscape modification is acceptable. A description of each VQO follows.

Visual Quality Objectives

Preservation - The landscape appears natural from any place within the area. Ecological changes are the only changes permitted. There are few management activities except for low-volume recreation facilities like trails. Facilities such as signs, buildings and viewing platforms are absent.

Retention - To the average forest visitor, activities are not evident from the viewing location; however, a variety of roads, viewing platforms, and parking areas may be present. Upon completion of the activity, the viewed area will only appear slightly altered. Vegetation and landforms are used to screen facilities and unwanted views. A variety of vegetation manipulation techniques are used to maintain and increase visual variety.

Management Area 10(A) - Non-Motorized Undeveloped Areas

Goals

To provide undeveloped natural areas for dispersed, non-motorized recreation opportunities and protection of resources.

Desired Condition

The area generally appears natural and unmodified with few facilities present except for occasional trails, dispersed camps and signs. Large portions of the area are remote and without trails. The area includes a variety of undisturbed and unimpacted habitats. Motorized use is absent except for administrative purposes. Other than near the corridors, recreation use is low-to-moderate and management presence of the Forest Service is low.

Management Area 10(A) Standards and Guidelines

Recreation, Facilities and Roads

A- 1. **ROS Standards** - Where possible, manage to meet SPNM standards; otherwise meet RN standards.

A- 2. **Undeveloped Areas** - Maintain at least two 1,200-acre areas without trails.

A- 3. **Trail Construction** - Construct trails at More Difficult - Most Difficult standards (FSH 2309.18).

A- 4. **Habitat Protection** - Minimize impacts of new and existing trails on plant and wildlife habitat, species and habitat components.

A- 5. **Minimize Impacts** - Design and locate facilities primarily to channel and minimize human impacts rather than for visitor convenience.

A- 6. **Natural Appearance** - Construct small facilities (15 PAOTS or less) that blend with the natural landscape.

Plant and Wildlife

A- 7. **Habitat Enhancement** - Protect and enhance habitats which provide diverse, unstructured plant and wildlife viewing opportunities.

A- 8. **Natural Appearance** - Make habitat enhancements look as natural as possible.

FW-030 **Resource Protection** - Protect resources considered eligible for the NRHP by making reasonable efforts to avoid adverse impacts to the resources or by developing a procedure to conserve the values through proper scientific methods and studies. Make additional efforts to protect eligible cultural resources from human depredation and natural destruction. Protection plans may include physical protection such as fences and barriers, scientific study and collection, patrol and site monitoring, proper use or removal of signs to maintain site anonymity, and gaining public understanding and support through education [36CFR 219.24 (4)].

FW-031 **Interpretation** - Provide interpretation of cultural resources for educational and entertainment purposes to the extent consistent with protection, public interest, and management requirements.

FW-032 **Burial Sites** - Protect known human burial sites from disturbance. If an unknown burial site is uncovered, afford it complete protection and respect until the proper people and authorities have been informed. If the burial is American Indian, notify the appropriate tribe immediately.

Visual Quality (Scenery)

FW-033 **VQOs** - Where no visual quality objective (VQO) is specified in management area direction, maximum modification is the minimum standard. Where it is practical and consistent with other resource objectives, blend the management activity with the surrounding landscape more than would be done for maximum modification.

Threatened, Endangered, and Sensitive Animals and Plants

FW-034 **Cooperation** - Identify and manage threatened and endangered (T&E) and sensitive species in cooperation with the USDI Fish and Wildlife Service (USFWS), Oregon Department of Fish and Wildlife (ODFW; fish and wildlife), and Oregon Department of Agriculture (plants).

FW-035 **Conservation** - Meet legal and biological requirements for conservation of T&E and sensitive plants and animals. Evaluate proposed projects that involve significant ground disturbance or have the potential to alter habitat of T&E or sensitive species ~~to~~ determine if any of these species are present (FSM 2670, T&E and R6 Sensitive Plants and Animals.)

FW-036 **Consultation** - Where T&E species are present, make the required determination (a biological assessment for an EIS and a biological evaluation for an environmental assessment) according to the requirements of the Endangered Species Act (Public Law 93-205). Consult with the USFWS and state agencies on each program activity or project that the Forest Service determines may affect T&E species, before any decision is made on the proposed project.

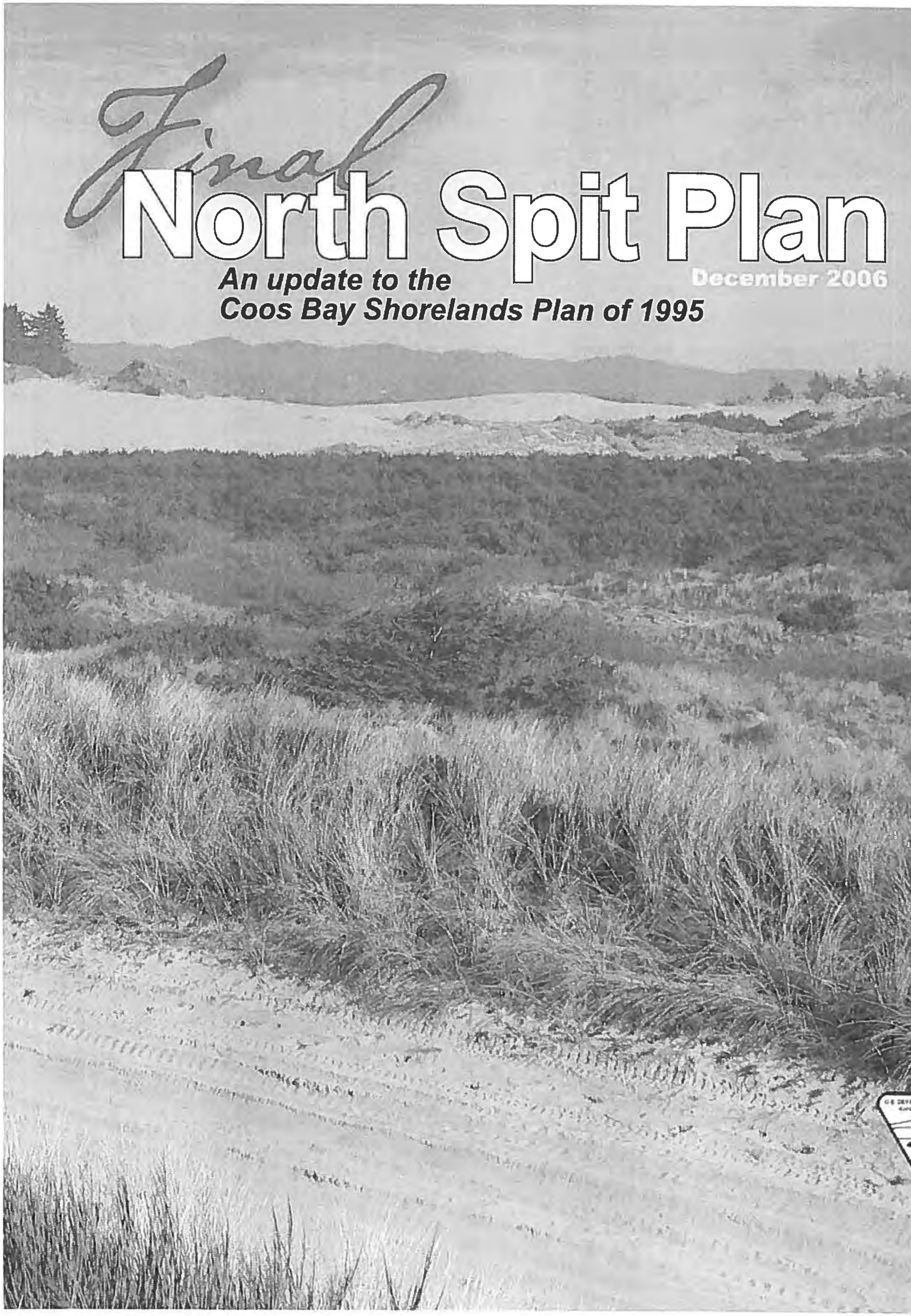
APPENDIX R-2

BLM North Spit Plan (excerpt)

Final North Spit Plan

An update to the Coos Bay Shorelands Plan of 1995

December 2006



BLM

Coos Bay District

Umpqua Field Office

Visual Resources

The public lands on the south shore of the North Spit are a dominant visual resource element in the overall scenic backdrop of the Coos Bay estuary. The quality of visual resources directly influences a community's potential for tourism, high-end real estate development, and the area's desirability for business and residential relocation.

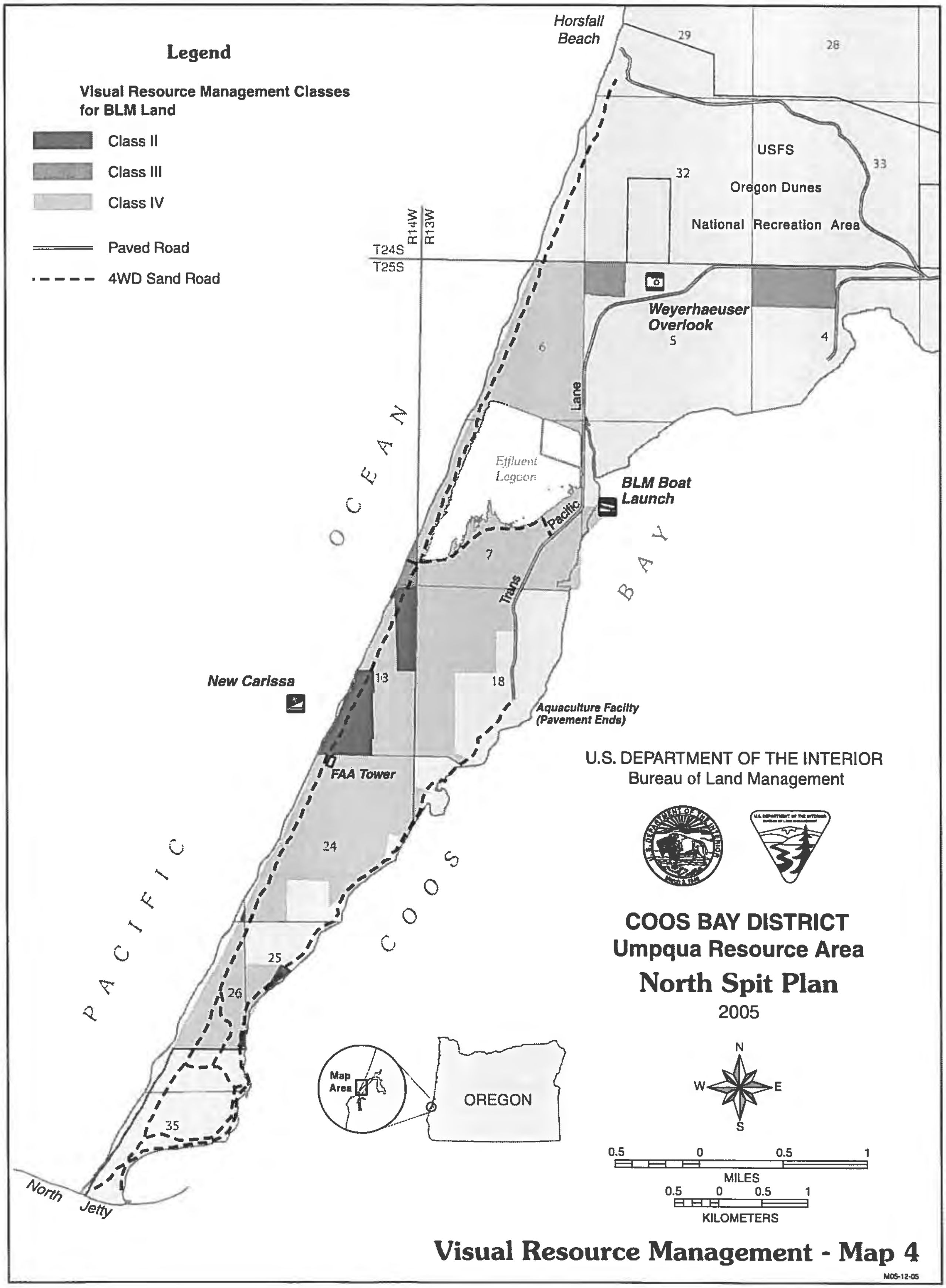
Visual resources on the public lands are managed through the BLM's land use planning process. Through this inventory and classification process, public lands are placed in one of four visual resource management classes. These management classes range from the total preservation of the existing landscape in Class I, to allowing major modifications of the landscape character in Class IV (Map 4). The lands on the North Spit were classified in the Coos Bay District RMP as follows:

- Class II. The public lands in the northwest corner of the ACEC and within the SRMA in T25S, R14W, Section 13 and T25S, R13W Section 18 were given this fairly protective classification to preserve the quality of the recreation setting. Objectives for Visual Resource Management in this area are to retain the existing character of landscape. Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the characteristic landscape. Contrasts are seen, but must not attract attention.

- Class III. Within two parcels adjacent to the Trans Pacific Lane in T25S, R13W in Sections 5 and 4, public lands were classified as Class III. Objectives for VRM management in these parcels would be to partially retain the existing character of landscape. Contrasts to the basic elements caused by a management activity are evident, but should remain subordinate to the existing landscape.

- Class IV. The majority of the public lands on the North Spit are VRM Class IV. VRM objectives in these areas allow for major modifications of the existing character of the landscape. Contrasts that are created by management activities may attract attention and be a dominant feature of the landscape in terms of scale, but should repeat the form, line, color, and texture of the characteristic landscape.

Driving the sand roads on the North Spit.



Visual Resource Management - Map 4

Partial-Retention - From the viewing location, management activities are more apparent to the average forest visitor. These activities are visually subordinate to the natural landscape, except in the first year or so. Lines, colors, forms and textures of the activity are borrowed from the surrounding landscape.

Modification - Management activities are not only seen but dominate the viewed landscape. Activities include providing facilities such as buildings, signs, roads, and parking lots.

Viewsheds

Since all NRA lands are seen, those not in viewsheds noted below will be managed with the VQO that corresponds with their assigned ROS classification. Lands that have been assigned as Roaded Natural, Semi-Primitive Motorized or Semi-Primitive Non-Motorized that are not in a viewshed, will be managed as retention.

Primary viewsheds at the NRA are those seen from overlooks, roads and trails. VQOs for these viewsheds are as follow:

Retention	All trails Oregon Dunes Overlook Highway 101 Umpqua Beach Road Siltcoos Road Threemile Road
Partial Retention	High Dunes Overlook South Jetty Road Horsfall Road

Scenery

Scenery is managed by controlling how and where it is altered from the natural appearance, and by introducing or maintaining variety in the viewed area. Individual projects will be analyzed with regard to their compatibility with VQOs. Use measures such as manipulation in landform, vegetative screening, redesign and relocation to ensure proposed projects harmonize with the landscape.

There are areas where vegetation is reducing visual variety. Examples are where beachgrass is moving in or where vegetation is allowed to grow and block views. Manage vegetation to maintain or enhance NRA visual variety and scenic quality. See the Potential Vegetation Management Areas Map accompanying this Plan for highest priority visual quality treatment areas.

APPENDIX R-3

Coos County Coos Bay Estuary Management Plan (excerpt)

APPENDIX 3

VOLUME II – Coos Bay Estuary Management Plan

POLICIES

II. It must be demonstrated through findings that the proposed use will not:

a. adversely affect agricultural and forest operations, and

b. interfere with the efficient functioning of urban growth boundaries.

III. The following are development standards for proposed commercial or industrial structures to be located on parcels which are abutting exclusive farm use or forest zoned properties:

a. All structures, except fences, shall be setback a minimum of thirty-five (35) feet from any road right-of-way centerline, or five (5) feet from any right-of-way centerline, whichever is greater; and

b. All structures being sited on parcels abutting exclusive farm use (EFU) or forest (F) zoned parcels, property owner(s)/applicant(s) shall acknowledge and file in the deed records of Coos County, a "Farm or Forest" Practices Management Covenant. The covenant shall be recorded in the deed records of the county prior to the County issuing a zoning compliance letter.

#17 Protection of "Major Marshes" and "Significant Wildlife Habitat" in Coastal Shorelands

Local governments shall protect from development, major marshes and significant wildlife habitat, coastal headlands, and exceptional aesthetic resources located within the Coos Bay Coastal Shorelands Boundary, except where exceptions allow otherwise.

I. Local government shall protect:

a. "Major marshes" to include areas identified in the Goal #17, "Linkage Matrix", and the Shoreland Values Inventory map; and

b. "Significant wildlife habitats" to include those areas identified on the "Shoreland Values Inventory" map; and

c. “Coastal headlands”; and

d. “Exceptional aesthetic resources” where the quality is primarily derived from or related to the association with coastal water areas.

II. This strategy shall be implemented through:

a. Plan designations, and use and activity matrices set forth elsewhere in this Plan that limit uses in these special areas to those that are consistent with protection of natural values; and

b. Through use of the Special Considerations Map, which identified such special areas and restricts uses and activities therein to uses that are consistent with the protection of natural values. Such uses may include propagation and selective harvesting of forest products consistent with the Oregon Forest Practices Act, grazing, harvesting wild crops, and low-intensity water-dependent recreation.

c. Contacting Oregon Department of Fish and Wildlife for review and comment on the proposed development within the area of the 5b or 5c bird sites.

This strategy recognizes that special protective consideration must be given to key resources in coastal shorelands over and above the protection afforded such resources elsewhere in this Plan.

#18 Protection of Historical, Cultural and Archaeological Sites

Local government shall provide protection to historical, cultural and archaeological sites and shall continue to refrain from widespread dissemination of site-specific information about identified archaeological sites.

I. This strategy shall be implemented by requiring review of all development proposals involving a cultural, archaeological or historical site, to determine whether the project as proposed would protect the cultural, archaeological and historical values of the site.

II. The development proposal, when submitted shall include a Plot Plan, showing, at a minimum, all areas proposed for excavation, clearing and construction. Within three (3) working days of receipt of the development proposal, the local government shall notify the Coquille Indian Tribe and Coos, Siuslaw, Lower Umpqua Tribe(s) in writing, together with a copy of the Plot Plan. The Tribe(s) shall have the right to submit a written statement to the local government within thirty (30) days of receipt of such notification, stating whether the project as proposed would protect the cultural, historical and archaeological values of the site, or if not, whether the project could be modified by appropriate measures to protect those values.

"Appropriate measures" may include, but shall not be limited to the following:

a. Retaining the prehistoric and/or historic structure in situ or moving it intact to another site; or

b. Paving over the site without disturbance of any human remains or cultural objects upon the written consent of the Tribe(s); or

c. Clustering development so as to avoid disturbing the site; or

d. Setting the site aside for non-impacting activities, such as storage; or

e. If permitted pursuant to the substantive and procedural requirements of ORS 97.750, contracting with a qualified archaeologist to excavate the site and remove any cultural objects and human remains, reinterring the human remains at the developer's expense; or

f. Using civil means to ensure adequate protection of the resources, such as acquisition of easements, public dedications, or transfer of title.

APPENDIX R-4

City of Coos Bay Comprehensive Plan 2000 (excerpt)

City of Coos Bay

COMPREHENSIVE PLAN 2000

Volume 1

Plan Policy Document
1987-2000

Coos Bay City Council
1981

UPDATED JUNE 2010

9.1 COOS BAY LAND USE PLAN 2000

This land use plan incorporates the desirable aspects of the two other plan alternatives, but it also plans for the expected population growth by increasing the densities in the residential holding reserve and it addresses all of the statewide planning goals. Because this plan makes changes in the present 1974 land use designations, it is extremely important that the land use ordinance provide a liberal "grandfather" clause for non-conforming uses. The land use plan map can be found at the end of this chapter. (Map 9.1-1)

Assumptions

The Land Use Plan is formulated upon the following basic assumptions about Coos Bay's future growth:

1. After a period of declining growth the City of Coos Bay will experience renewed community growth resulting from in-migration and new commercial employment opportunities.

2. That the City of Coos Bay will grow in regional significance and will remain the center of the largest urban area on the Oregon Coast.

3. That the physical, fiscal and social problems normally associated with urban living are often caused by uncontrolled and undirected population growth.

4. That future city growth will be guided in accordance with sound urban planning principles and practices, including environmental, economic and social consideration.

5. That approximately 116 additional housing units will be needed in Coos Bay by the year 2000 to adequately accommodate the 17,375 people that are expected to reside in the city at that time.

6. That the substantial transition of single-family and duplex housing surrounding and adjacent to commercial areas will not be transformed to apartment densities because these neighborhoods are typically stable,

7. That residential development must provide for increased dwelling unit densities at suitable locations, including areas not previously considered suitable for apartments, in order to enhance affordable housing opportunities for city residents.

8. That the City of Coos Bay will have to consider the redevelopment of commercial and industrial areas to bolster the city's economic base.

9. That the waterfront areas are an asset to the city's water-dependent commerce and industry and are also major scenic attractions.

Objective 5 - This plan shall maintain a sufficient amount of residential lands in order to assure an adequate amount of housing for future residents.

Rationale - Undeveloped lands along the inner fringe of the city shall be utilized for future residential development. The terrain of this land is rough and, at present, it remains undeveloped. Population projections indicate that this land will be needed for residential use within this 20-year planning period. (City of Coos Bay, 1981; II) (H. 2, H. 4)

Implementation - The Multiple Residential (R-3) allows for an increased density that may stimulate construction so that local developers can realize a satisfactory return on their investment to permit costly access and facility extensions to the growth areas. The increased density provisions are not intended to cause massive apartment construction in these undeveloped areas. Topography and physical constraints will limit this. Rather, the density is intended to stimulate well-planned cluster subdivisions and planned unit developments to maximize the buildable portions of the areas. This concept can be implemented by special zoning provisions, perhaps a "floating-zone" to require careful site review to maintain maximum compatibility among the respective residential developments.

Commercial Areas

Objective 1 - The City shall protect the integrity of established land use patterns to facilitate continued and compatible development.

Rationale - Much of the industrially-designated land of the 1974 Plan has been found to be commercially oriented. This plan shall recognize the commercial nature of these areas. (ED. 5, 11)

Implementation - Areas zoned for Industrial-Commercial (I-C) development shall preserve the commercial character of these lands.

Objective 2 - It is important that the Central Business District (CBD) and its supportive commercial sub-districts remain efficient, prosperous, and easily accessible since commerce is a major source of revenue and is a necessity to the economic stability and future growth of the city. Efforts toward redevelopment of older, underutilized commercial areas will be encouraged.

Rationale - Commercial trade and service activities are the foundation of the economic system of the city. Supporting these activities by zoning sufficient lands for them will keep them viable and will prevent a dollar drain to other communities. (ED. 5, 6, 7, 8, 10, 11, 12)

Implementation -This objective will be realized by the following commercial zones: Central Commercial (C-1), General Commercial (C-2), Waterfront Heritage (W-H) and Industrial/Commercial (I-C) zoning designations of the Land Development Ordinance.
[ORD. 304 5/1/01]

1. Central Commercial. The focus of this district is the central business district encompassing the mall area, north along Broadway to Market Street and south to portions of Golden Avenue. Primary activities in this district will be retail stores, service establishments, financial institutions, business and professional offices, cultural attractions, and public facilities.

2. General Commercial. These areas are intended to provide for all other retail trade, commercial service and professional activities that constitute the essential base of the city's economy. Appropriate locations for commercial development include (1) established commercial areas, and (2) highway corridors not committed to less intensive land uses.

3. Industrial/Commercial. These areas are intended to provide for a compatible mixture of commercial and light industrial activities that are also essential to the city's economy. An industrial/commercial area is a new classification and is consistent with the policy of insuring existing land use integrity. Much of Coos Bay's traditional light industrial and restricted industrial use zones are actually commercial/industrial because city ordinance has historically allowed the compatible mix mentioned above. Appropriate locations for commercial/industrial development are generally those areas north and south of the downtown commercial core and near U.S. Highway 101, and to a lesser extent near Lockhart Avenue, Easterly from 7th Street.

4. Waterfront Heritage. The focus of this district is to provide diversity to the economy by providing a mixed use area to include: existing waterfront industrial uses, new water oriented, water-related and non water-related service businesses, and amenities and attractions which encourage public access to and enjoyment of the waterfront and also non-water-dependent industrial uses. This area is intended to reclaim the city's waterfront heritage and express pride in its past and present by redeveloping Front Street as a vital commercial area which evokes, but does not necessarily duplicate, the Front Street of early Marshfield.
[ORD. 304 5/1/01]

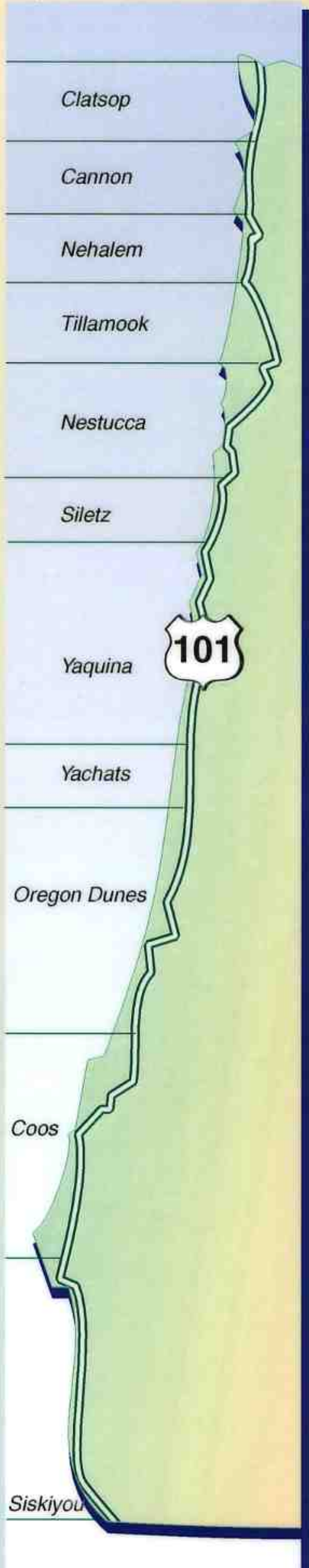
5. Hollering Place. The focus of this district is to provide a mix of uses and activities that will complement and connect with the existing business district to the east and act as a catalyst to help spur additional development and investment in the Empire area. The area is intended to increase the pedestrian connection to the water and create the Story Trail as laid out in the Hollering Place Master Plan, adopted December 2, 2008, which presents the unique history of the Hollering Place.
[ORD. 430 6/15/10]

There are separate plans for these two objectives.

APPENDIX R-5

Pacific Coast Scenic Byway Corridor Plan for US 101 in Oregon (excerpt)

Pacific Coast Scenic Byway Corridor Management Plan for U.S. 101 in Oregon



December 1997

Section 5
Summary of Regional Plans

Pacific Coast Scenic Byway

South Dunes Region

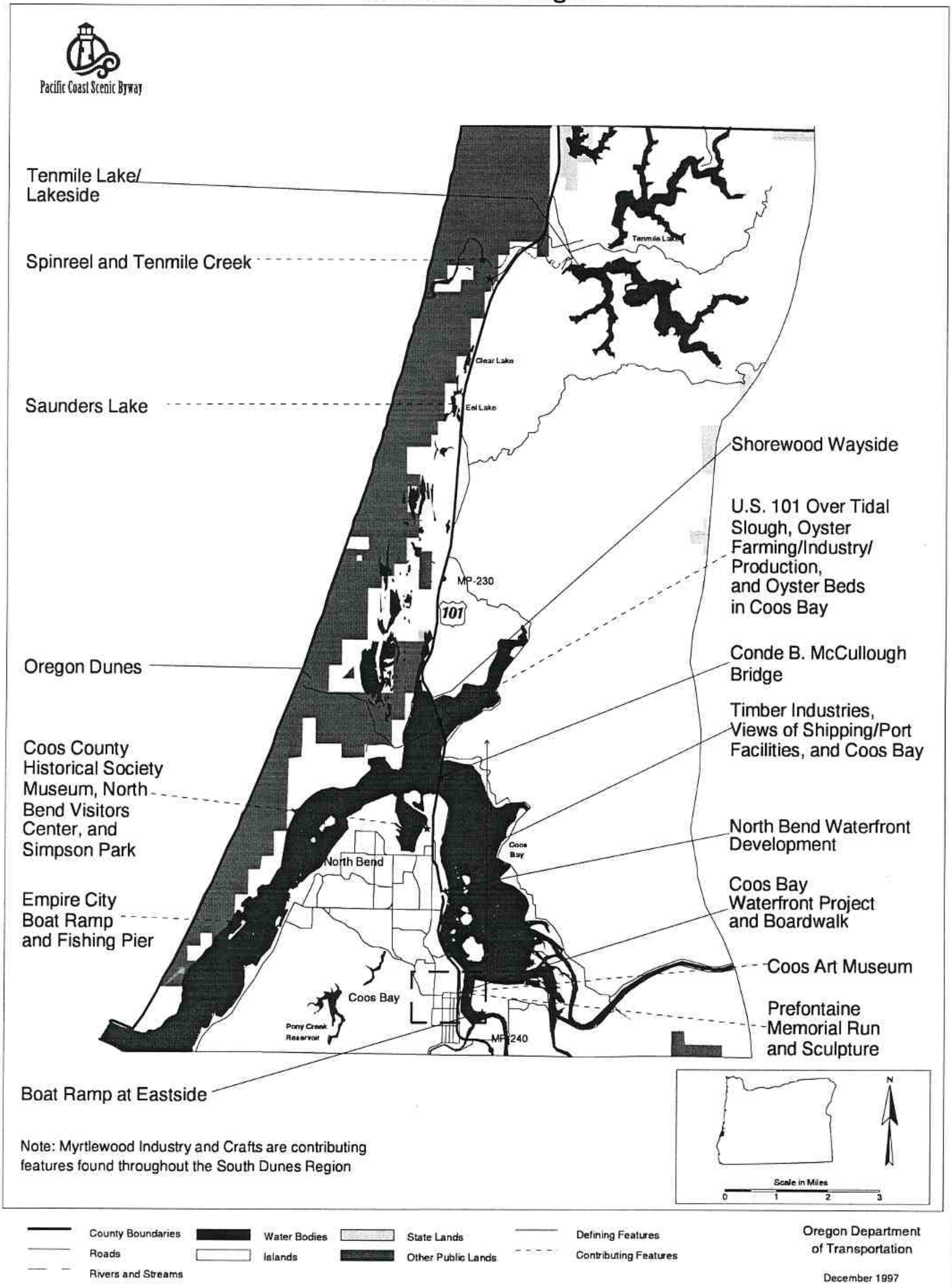


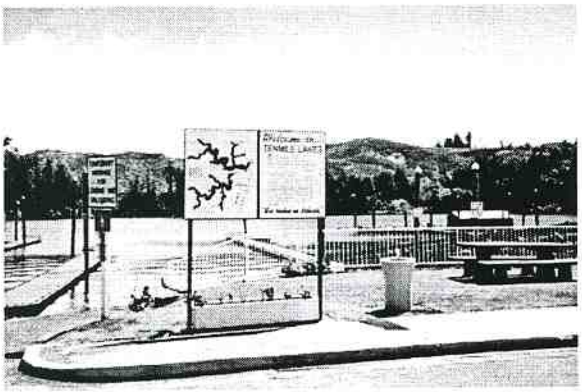
Table 5-14

Features, Intrinsic Qualities, and Management Goals for the **South Dunes Region[1]**

	Type[2]		Intrinsic Qualities						Management Goals					
	Defining	Contributing	Scenic	Historic	Cultural	Recreational	Natural	Archaeological	Enhancement	Stewardship	Awareness	Interpretation	Access	Priority Project[3]
Tenmile Lake/Lakeside	●		●	●	●	●	●		●		●	●		●
Oregon Dunes	●		●			●	●			●	●	●	●	●
Shorewood Wayside	●					●	●		●			●	●	●
Conde B. McCullough Bridge	●			●					●	●		●		●
Timber Industries, View of Shopping/ Port Facilities, and Coos Bay	●		●	●	●	●	●		●			●	●	
North Bend Waterfront Development	●			●	●	●			●			●	●	●
Coos Bay Waterfront Project and Boardwalk	●			●					●			●	●	●
Boat Ramp at Eastside	●			●		●			●		●	●		
Eel Creek, Eel Lake and William M. Tugman State Park[4]		●	●			●	●				●	●		
Spinreel and Tenmile Creek		●	●			●	●		●			●		
Saunders Lake		●	●			●	●				●	●		
U.S. 101 over Tidal Slough, Oyster Farming/ Industry/Production, and Oyster Beds in Coos Bay		●	●				●				●	●		
Coos Historical Society Museum, North Bend Visitors Center, and Simpson Park		●		●						●	●	●	●	
Myrtlewood Industry and Crafts		●		●	●						●	●		
Coos Art Museum		●		●	●						●			
Prefontaine Memorial Run and Sculpture		●		●	●	●					●			
Empire City and North Spit Boat Ramp		●		●		●				●				

Notes: 1. For an explanation of these terms, refer to "Orientation to the Plan's Framework" in Section 2.
2. "Recognized" features are listed in the section titled "Intrinsic Qualities and Features" of the Regional Management Plan.
3. Feature is associated with a priority project identified by the regional planning group. For a description, refer to the section titled "Project Selection" in the Regional Management Plan.
4. Location identified on Central Dunes Region Map.

SOUTH DUNES DEFINING FEATURES



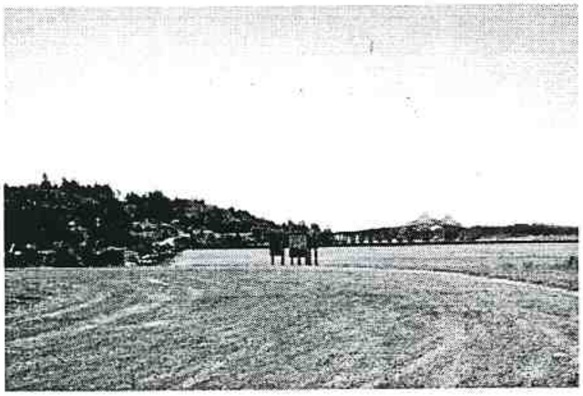
Tenmile Lake/Lakeside

The City of Lakeside serves as the northern gateway to Coos County. The City welcomes visitors to the area, offering recreational opportunities at Tenmile Lake, the fourth largest lake and the fifth most used lake in Oregon. Over 400 private residences surround the lake, a popular fishing destination. The three developed County Parks and Recreation facilities on the lake collectively contain boat ramps, docks, picnic facilities, toilets, wading and swimming areas and horseshoe courts.

Oregon Dunes

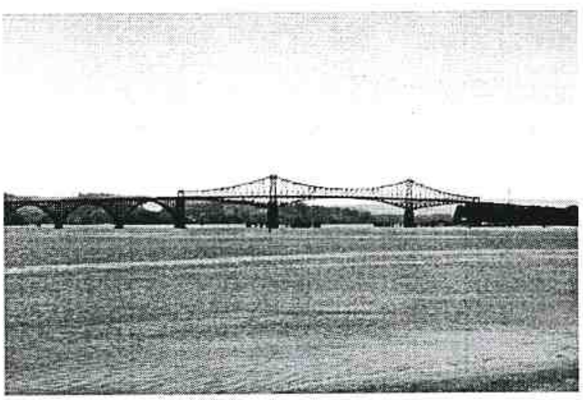
In 1972, the U.S. Congress designated the Oregon Dunes as a national treasure. Located along a 40-mile expanse between Florence and North Bend, the Oregon Dunes National Recreation Area (ODNRA) constitutes one of the largest expanses of temperate coastal sand dunes in the world. The rare proximity of dunes, forests and ocean offers a unique home to a diversity of plants and animals, amid the large, oblique dunes found only here. Visitors can explore the wonders of the Oregon Dunes through an abundance of recreational opportunities.

Within the Coos County section of the Oregon Dunes, the Horsfall and Bluebill areas provide ODNRA beach and dune access. In addition to camping facilities, the areas offer day use parking and toilets. The ODNRA trailhead near Lakeside gives visitors a taste of the dunes through interpretive signs and a one-mile loop hike. Just north of the Douglas County Line, the High Dunes viewpoint offers a particularly clear view of one of the highest of the Oregon Dunes.



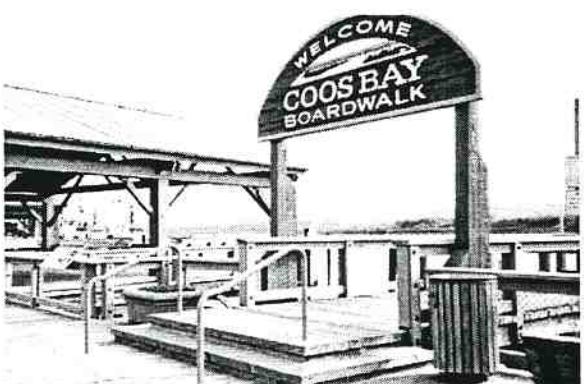
Shorewood Wayside

Currently undeveloped, this area will eventually become a wayside containing interpretive signs and visitor amenities. Informational signs at the site will describe such nearby attractions as the Oregon Dunes. Conde B. McCullough Bridge is visible from the wayside, while adjacent areas provide opportunities for soft-shell clamming and windsurfing.



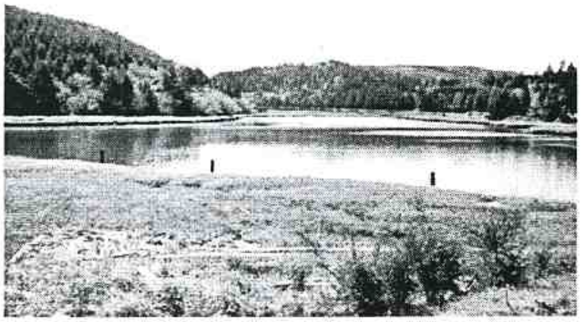
Conde B. McCullough Bridge

During the first half of the twentieth century, Conde B. McCullough designed numerous bridges throughout Oregon's southern coast. This bridge, the last he designed, is the culmination of McCullough's skill and experience. Named to honor its creator, the Conde B. McCullough Bridge has become a celebrated symbol of Coos Bay.



Coos Bay Waterfront Project and Boardwalk

Existing and proposed improvements to the Coos Bay waterfront and boardwalk have been planned to provide public access. Waterfront and boardwalk development includes aspects of timber industries, view of shipping/port facilities, and Coos Bay. Development will be managed in conjunction with these interests.



Boat Ramp at Eastside

Not yet in existence, the Eastside Boat Ramp will provide access to Coos Bay and the fisheries in the Coos River and Isthmus Slough from the Eastside area. As approved in Phase I of the project, the new facility will include a two-lane concrete boat ramp, gravel parking and access road and wooden boarding floats. Phase I also includes mitigation work at the site.

Timber Industries, Views of Shipping/Port Facilities, and Coos Bay

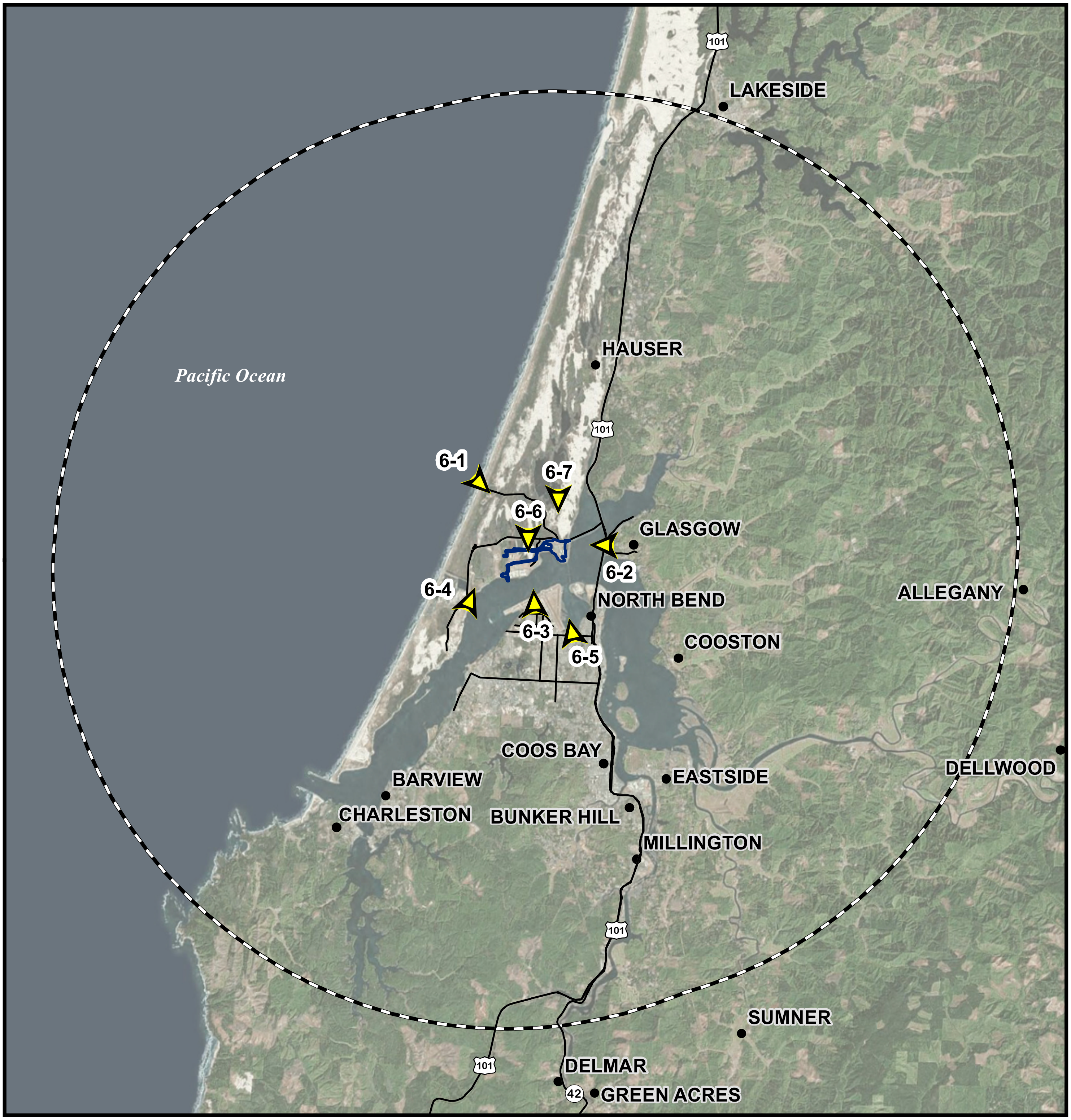
Together, the three components of this feature have guided the history, culture, and economic development of cities and rural areas along the U.S. 101 south coast corridor. There are opportunities in North Bend and Coos Bay to provide travelers on U.S. 101 with views, interpretation, and access to this piece of the region's history and economy.

North Bend Waterfront Development

Improvements to the North Bend waterfront have been planned to provide public access. Waterfront development will be managed in conjunction with timber industries, view of shipping/port facilities, and Coos Bay, as identified in Feature 12.

APPENDIX R-6

Photos and Visual Simulations from Viewpoints, with Location Map



N

0 1.5 3 Miles

1 inch = 3 miles

EFSC Site Boundary

Analysis Area (10 mile buffer from EFSC Site Boundary)

Photo Viewpoint Location and Direction

South Dunes Power Plant Project

EFSC Application

EXHIBIT R
Figure R-6
Visual Simulation
Photo Viewpoint Locations

Date: 9/22/2014
Reviewed By RH
Designed By SAST

Existing view from Horsfall Beach Campground/Parking/Staging area in Oregon Dunes National Recreation Area

Visual Simulation of Stacks/HRSG Units 1-6

Existing view from Highway 101

Visual Simulation of LNG Storage Tanks and Stacks/HRSG Units 1-6

Jordan Cove Energy Project, L.P.	Figure 6-2: Existing View and Visual Simulation Highway 101	Exhibit R-Appendix 6 Photos by SHN Consulting 03.22.2013

Existing view from Airport Lane

Visual Simulation of Stacks/HRSG Units 1-6

Existing view from BLM North Spit Boat Launch area

Visual Simulation of Stacks/HRSG Units 1-6

Jordan Cove Energy Project, L.P.	Figure 6-4: Existing View and Visual Simulation BLM North Spit Boat Launch Area	Exhibit R-Appendix 6 Photos by SHN Consulting 03.22.2013

Existing view from Pony Slough

Visual Simulation of Stacks/HRSG Units 1-6

Jordan Cove Energy Project, L.P.	Figure 6-5: Existing View and Visual Simulation Pony Slough	Exhibit R-Appendix 6 Photos by SHN Consulting 03.22.2013


Existing view from TransPacific Parkway


Visual Simulation of Transmission Corridor

Jordan Cove Energy Project, L.P.	Figure 6-6: Existing View and Visual Simulation TransPacific Parkway	Exhibit R-Appendix 6 Photos by SHN Consulting 03.22.2013

Existing view from “Boxcar Hill”

Visual Simulation of South Dunes Power Plant

APPENDIX R-7

Lighting Methods and Proposed Site Lighting Plan

MEMORANDUM

Jordan Cove Energy Project	B&V Project 17884
Project Name: Jordan Cove Energy Project	B&V File 36.1018
South Dunes Power Plant Lighting Memorandum	30 September 2014

To: Project File

From: Kent Hessler, Lighting Section Lead

I am an electrical engineer currently employed by Black & Veatch. I have been employed at Black & Veatch for 32 years and have been involved with lighting design for 25 of those years. My training and experience as an engineer doing lighting design provides expertise with respect to the type of lighting and lighting fixtures required for a power plant facility. This expertise enables me to select, locate and choose shielding to divert excessive illumination from sensitive areas.

The exterior lighting for the South Dunes Power Plant will be designed to mitigate light emissions from the facility. The illumination levels will be in accordance with Illuminating Engineering Society (IES) handbook recommendations and the perimeter fence will be illuminated in accordance with US Coast Guard security requirements. Various methods will be used, including utilization of low-emission light fixtures, using lighting fixtures only when required for safety and security, and shielding the illumination source on light fixtures in order to limit light emissions to the specific area requiring illumination. The exterior lighting will use LEDs as a lamp source.

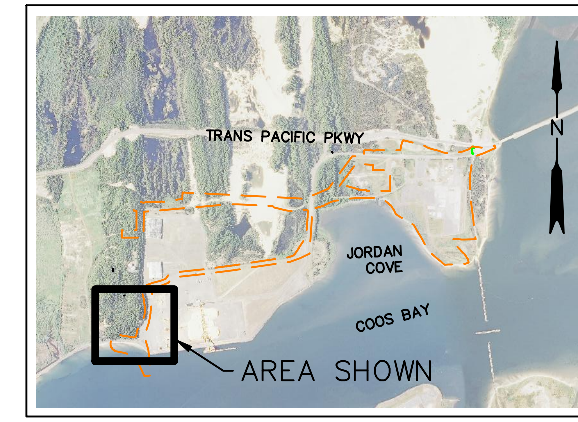
Many of the active operational areas at the South Dunes Power Plant will be located indoors. These operational areas include the control room, water treatment facilities, maintenance shops, and administrative offices. As such, the only exterior lighting that will be required for the facility will be for vehicular traffic areas, safe personnel passage, monitoring of the perimeter fence and areas requiring visual inspection. The South Dunes Power Plant is expected to have exterior lighting at the plant entrance, the corridor to the plant and the service road around the facility, perimeter fence, the parking areas at the administration/maintenance building, at pedestrian entrances to the various facility buildings and along walkways between the buildings, and the stairs and platforms on the turbine generators, heat recovery steam generators (HRSG) and air-cooled condensers.

The entrance, facility service road, perimeter fence and parking area will be illuminated with roadway lighting fixtures on 30-foot tall poles. These fixtures will have a cobra head appearance and cutoff optics. The cutoff fixtures are designed such that the light source is not visible until near the fixture. Use of this type of fixture will ensure that roadway lighting at the South Dunes Power Plant will be less obtrusive than typical urban roadway lighting. The building pedestrian entrances will be illuminated with fully shielded fixtures mounted directly above the doors. These fixtures will only provide illumination in a downward direction at the door location. The IES has developed a rating system for backlight, uplight, and glare (BUG). The fixtures used for illuminating walkways or ground level equipment will be provided with fixtures that have an uplight rating of near zero, which indicates the light will be projected below the horizontal plane of the fixture. Any floodlights that are required will be directed inward toward the facility and will be provided with top and side shields.

Exterior lighting that is required for safe passage around the facility will be photocell controlled. Exterior lighting that is only required for periodic maintenance will be switch controlled and normally turned off. This will include many higher elevation areas that may be visible from offsite such as the upper platforms of the air-cooled condensers, HRSG and pipe racks. Selected roadway and parking area lighting may also be able to be switched off unless required for maintenance use.

Although the Federal Aviation Administration will make the final decision regarding aviation obstruction lighting on the facility exhaust stacks, it is not anticipated that they will be required. If they are required, they would consist of the flashing and steady burning red lights typically seen on taller communications towers.

A preliminary lighting analysis was performed using AGi32, a lighting analysis software, to evaluate the impacts of lighting from the power plant. The results of the lighting analysis demonstrate there will be little wasted illumination spilled on adjacent properties from the facility or into the water at the shoreline. While this is a preliminary lighting design, based upon the planned light fixtures and illumination modelling, we anticipate minimal to no levels of light beyond 80 feet from the light sources along roadways and the fence line. The attached Figures 1 – 3, illustrate the results of the model and show the projected distances to 0.0 foot-candles.



KEY MAP

FIXTURE LIST				
QUANTITY	SYMBOL	FIXTURE TYPE	LAMP WATTS	MTG EL
9	SLEDA	LED ROADWAY 13KLUMEN, NARROW DIST	LED	35'-0"

NOTE:

1. This drawing is for information only and is not for construction.

2. Lighting design shown is based on data provided by Black and Veatch. For original design drawing see Black and Veatch drawing no. 182962-SE-E2605 dated 9/12/14.

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

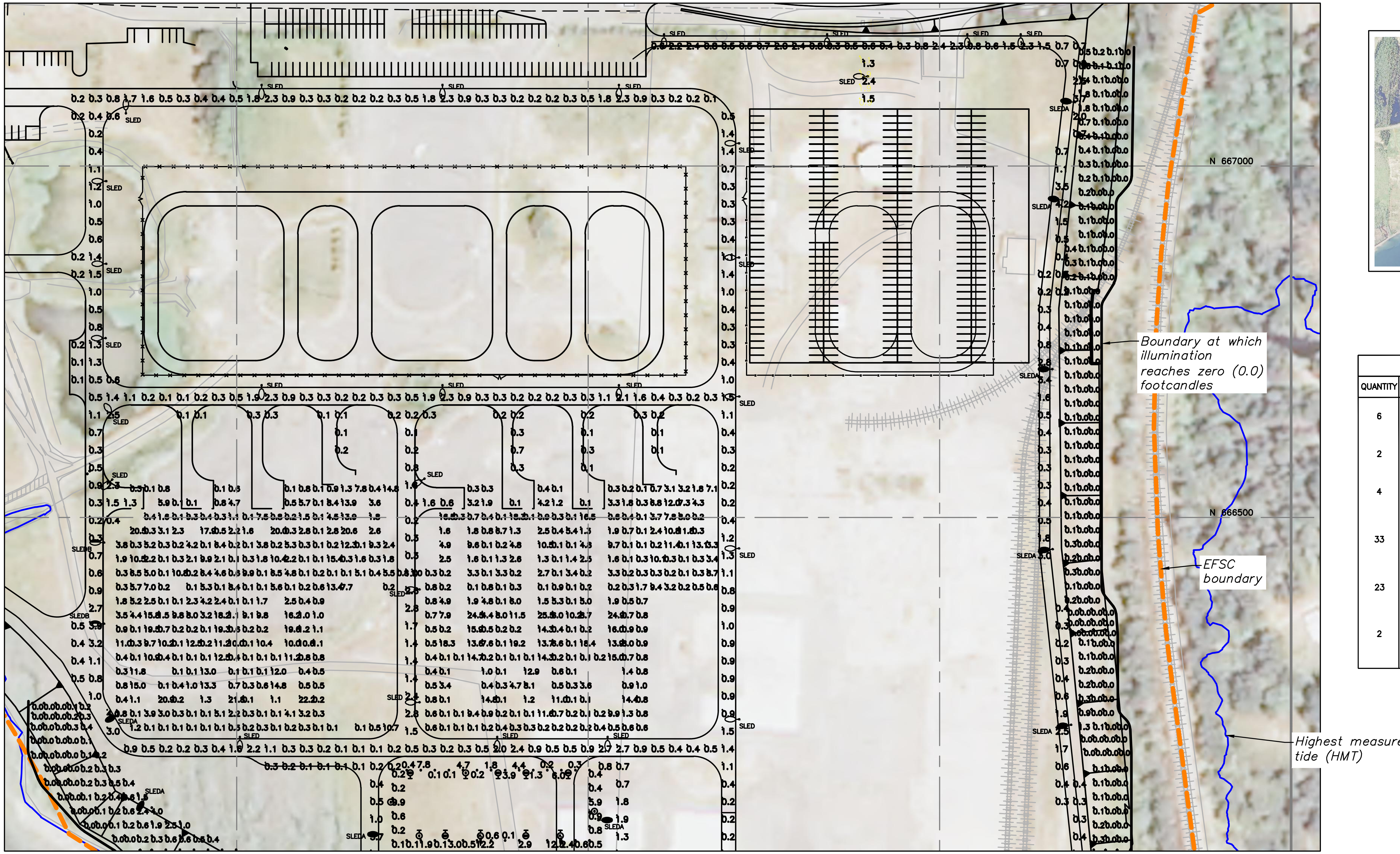
JORDAN COVE ENERGY PROJECT
SOUTH DUNES POWER PLANT

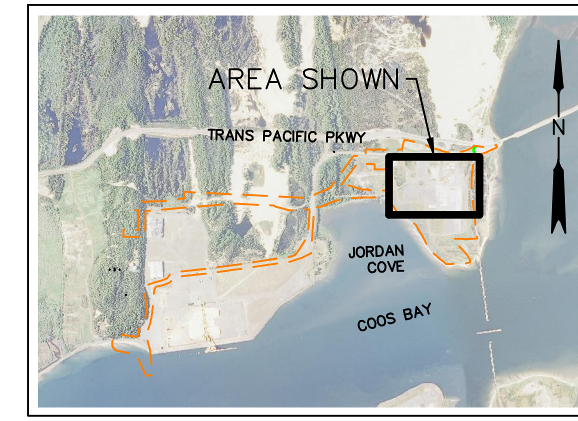
COOS COUNTY

Reviewed By – SPS
Designed By – Black and Veatch
Drafted By – JND

BARGE BERTH
PRELIM. LIGHTING ANALYSIS
1 OF 3

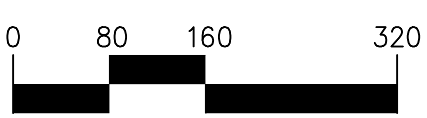
SHEET NO. 1





KEY MAP

FIXTURE LIST				
QUANTITY	SYMBOL	FIXTURE TYPE	LAMP WATTS	MTG EL
6	BBV	BRACKET MOUNTED LED	LED	7'-6" ABOVE FLOOR
2	FL	FLOOD LIGHT LED	LED	7'-6" ABOVE FLOOR
4	G	OUTDOOR WALL MOUNTED LED	LED	8" ABOVE DOOR FRAME
33	SLED	LED ROADWAY 7000LUMEN, NARROW DIST	LED	35'-0"
23	SLEDA	LED ROADWAY 13KLUMEN, NARROW DIST	LED	35'-0"
2	SLEDB	LED ROADWAY 20KLUMEN, NARROW DIST	LED	35'-0"



NOTE:

1. This drawing is for information only and is not for construction.

2. Lighting design shown is based on data provided by Black and Veatch. For original design drawing see Black and Veatch drawing no. 182962-SE-E2604 dated 9/12/14.

DAVID EVANS AND ASSOCIATES, INC.
2100 Southwest River Parkway
Portland Oregon 97201 Ph: 503.223.6663

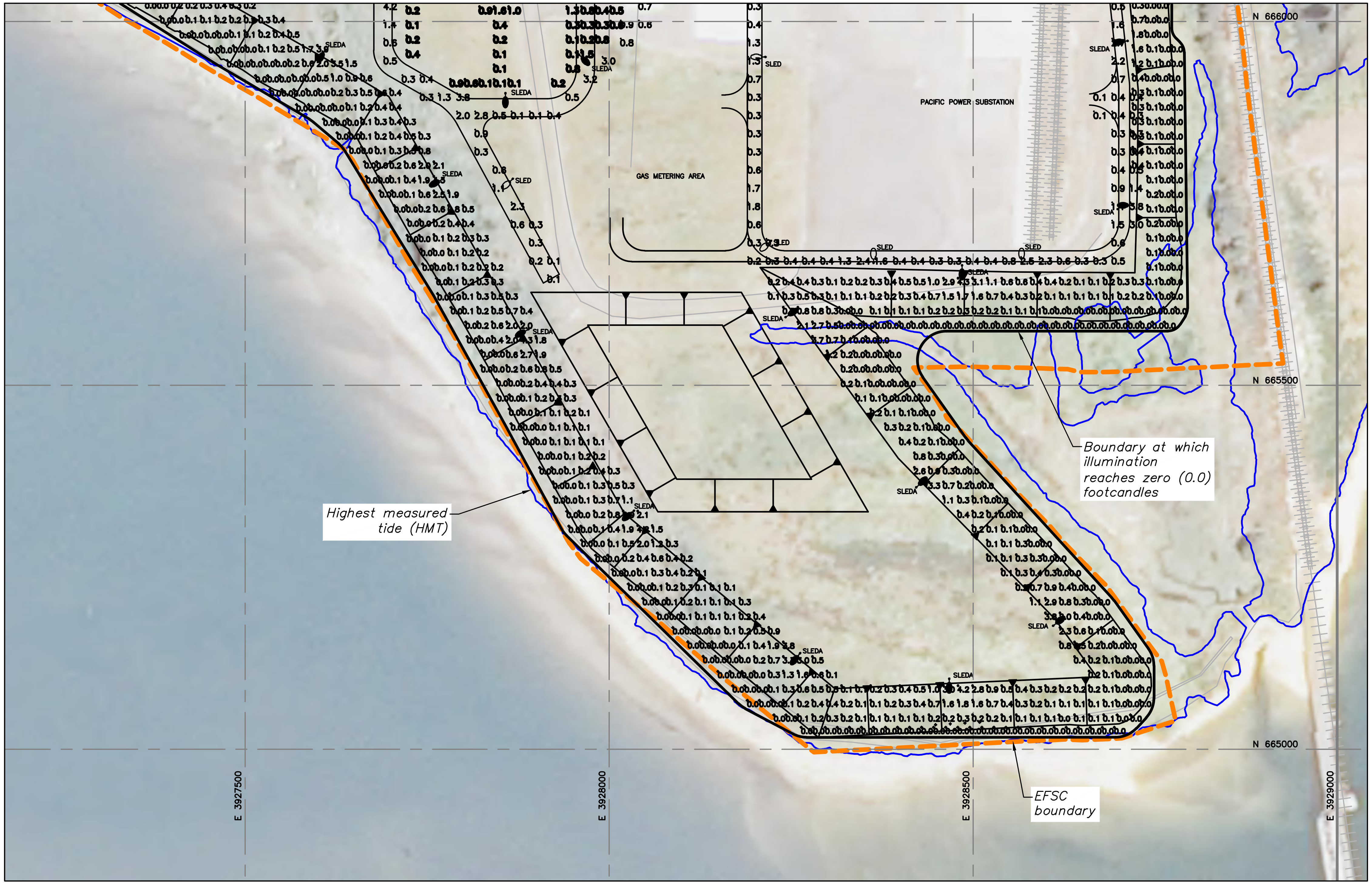
JORDAN COVE ENERGY PROJECT
SOUTH DUNES POWER PLANT

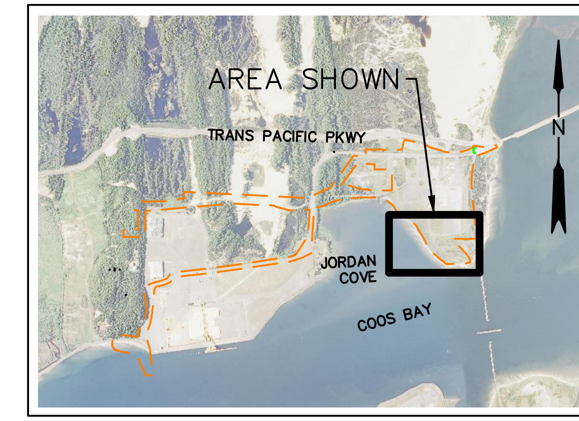
COOS COUNTY

Reviewed By – SPS
Designed By – Black and Veatch
Drafted By – JND

SDPP NORTH
PRELIM. LIGHTING ANALYSIS
2 OF 3

SHEET NO. 2





KEY MAP

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QUANTITY	SYMBOL	FIXTURE TYPE	LAMP WATTS	MTG EL
6	BBV	BRACKET MOUNTED LED	LED	7'-6" ABOVE FLOOR
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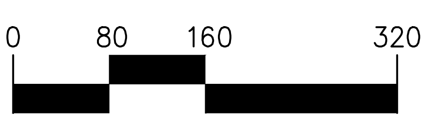
23	SLEDA	LED ROADWAY 13KLUMEN, NARROW DIST	LED	35'-0"
2	SLEDB	LED ROADWAY 20KLUMEN, NARROW DIST	LED	35'-0"

NOTE:

1. *This drawing is for information only and is not for construction.*

2. *Lighting design shown is based on data provided by Black and Veatch. For original design drawing see Black and Veatch drawing no. 182962-SE-E2604 dated 9/12/14.*



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2100 Southwest River Parkway
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JORDAN COVE ENERGY PROJECT
SOUTH DUNES POWER PLANT

COOS COUNTY

Reviewed By – SPS
Designed By – Black and Veatch
Drafted By – JND

SDPP SOUTH PRELIM. LIGHTING ANALYSIS
3 OF 3

SHEET NO. 3

KENT A. HESSLER

Lighting and Communications Section Lead

Various Electrical Systems, including Auxiliary Power, Lighting, Communication, and Security Systems.

Education
Bachelor of Science, Electrical Engineering, University of Kansas, 1982

Professional Registration
1991, Kansas, Engineer-in-Training

Total Years Experience
30

Joined Black & Veatch
1982

Language Capabilities
English

Kent A. Hessler is Lighting and Communications Section Lead for Black & Veatch (B&V) Energy. His primary responsibilities involve the design processes and methods used by B&V Energy personnel to execute lighting and communication engineering. This includes development and enforcement of practices, specifications, guides, and standards that drive a consistent work product. He also provides technical consulting and support for various areas of plant lighting philosophy and supervises other members within the section. Hessler previously served as Electrical Engineer on B&V energy projects.

Representative Project Experience

Lighting and Communications Section Lead/Process Owner
2011-Present
Electrical Engineer. Functions as the section leader in B&V Energy's Electrical Department for lighting and communications. Manage a five member staff by setting daily work tasks, schedules, budgets, as well as performance management and annual evaluations. Responsible for the upkeep and maintenance of approximately 5 company guides as well as 1 standard used throughout energy division worldwide. Provides conceptual design and estimating of lighting/communications systems to support B&V energy proposals.

Kusile Power Station; Eskom; Sunning Hill, South Africa
2009-2010
Electrical Engineer. Working in the South Africa engineering office in a liaison role between the design team and client. Electrical team member for the turbine, miscellaneous structures, and building management system (BMS) contracts. Administrator for the electrical construction contract, which involves preparing and presenting a multidiscipline review for the electrical construction contract and assisting in the preparation of prequalification and tender documents.

Applegate Energy Center; University of Kansas Medical Center; Kansas City, Kansas
2008-2009
Electrical Engineer. Assisted in generating a construction package for the upgrade of normal and emergency distribution systems. This included new diesel generators, transformers, switchboards, medium voltage gas switches, and motor control centers. Also performed cable sizing, motor control center layout, panelboard breaker assignments, and specification work.

Wood Gasification Steam Plant; Johnson Controls, Inc.; Oak Ridge, Tennessee
2008
Electrical Engineer. Assisted in developing conceptual design documents for a biomass boiler. This included design work on a small steam turbine generator, fuel handling facility, and existing plant electrical upgrades.

Computer Data Center; Pilgrim's Pride Corporation; Richardson, Texas
2007-2008

Electrical Engineer. Assisted in generating a construction package for data center rooms that totaled approximately 14,000 square feet. Design included three 480 volt switchgear buses, uninterruptible power supply, chillers, and standby diesel generation. Detailed design also included lighting with motion sensor control; heating, ventilating, and air conditioning (HVAC) starters; and receptacles.

Lowman Power Plant Air Quality Control System (AQCS) Additions; 600 MW Coal Fired Power Station; Alabama Electric Cooperative (AEC); Leroy, Alabama
2005-2007
Electrical Engineer. Responsible for administering the contracts for 4.16 kV switchgear, secondary unit substations, motor control centers, medium voltage variable frequency drives, power transformers, and cable bus. Also performed cable sizing, motor control center layout, and panelboard breaker assignments and supervised lighting design. Performed factory surveillance of electrical equipment buildings that housed switchgear, batteries, and motor control centers. Spent some time onsite overseeing data gathering being done by the local architect-engineer.

Louisville District Indefinite Delivery Contract - Military and Civil Works; Various Locations: C-5 Squadron Operations Facility, Alter Maintenance Shops, Alter Flight Simulator, Wright-Patterson Air Force Base; US Army Corps of Engineers Louisville District; Dayton, Ohio
2004-2005
Lead Electrical Engineer. Responsible for the complete electrical design of the project. This included overhead and underground primary distribution, interior distribution, lighting, grounding, lightning protection, communications, and security. Provided design to meet LEED (Leadership in Energy and Environmental Design) and latest UFGS (Unified Facilities Guide Specifications) requirements. Communications included a mass notification system to meet UFCS requirements.

Turkey Point Nuclear Generating Station; Florida Power & Light Company (FPL); Miami, Florida
2004
Electrical Engineer. Conducted the security design for the nuclear power plant. Responsibilities included overseeing the Intelli-field perimeter protection system, coordinating with procurement staff, attending daily project summary meetings, and providing input on the client's plant change modification packages.

Various Projects
2000-2004
Electrical Engineer. Functioned as the section leader in B&V Energy's Electrical Department for lighting and communications. Provided oversight for a seven-member staff that produced drawings, specifications, procurement packages, and department standards for the lighting and communications needs of power projects.

Tuas Power Project; Tuas Power Company; Singapore

1999-2000

Electrical Engineer. Designed the telephone, paging, card access, and closed-circuit television systems for the station.

Hidd Power Project; ABB SAE Sadelmi; Bahrain
1997-1998

Electrical Engineer. Designed the communications, lighting, security, and clock systems for the station.

Hopewell Pagbilao, Units 1 and 2; Mitsubishi Heavy Industries Ltd.; Pagbilao, Philippines
1994-1995

Electrical Engineer. Designed the communications system for the station.

Power Building Addition; Black & Veatch; Overland Park, Kansas
1994-1995

Electrical Engineer. Responsible for the electrical design of the office addition.

Tenaska Ferndale Cogeneration Station; Tenaska; Ferndale, Washington
1993-1994

Electrical Engineer. Designed the lighting and communications systems for the project.

Clover Power Station; Old Dominion Electric Cooperative; Clover, Virginia
1990-1992

Electrical Engineer. Designed the communications system for the project.

Sherco; Northern States Power Company; Becker, Minnesota
1989-1990

Electrical Engineer. Designed the personnel warning system for the project.

FPL; Juno Beach, Florida
1988

Field Engineer. Worked in the FPL home office. Reviewed consultant's drawings for support buildings and prepared plant change packages for Turkey Point Nuclear Station.

Office Building; Empire District Electric Company; Joplin, Missouri
1986-1987

Electrical Engineer. Responsible for the electrical design of the office addition.

Salt River Project; Coronado Generating Station; St. Johns, Arizona
1986-1987

Electrical Engineer. Designed the communications system for the project.

Intermountain Power Project; Intermountain Power Agency; Delta, Utah

1983-1984
Electrical Engineer. Planned the communications system and various lighting systems for the project.

Rawhide Power Station; Platte River Power Authority; Fort Collins, Colorado
1982
Electrical Engineer. Ensured functionality for the lighting design project.

APPENDIX R-8

Coos County Comprehensive Plan: Vol. II, Inventories (Excerpt)

POTENTIAL CONFLICTS

All of the "outstanding scenic resources" are considered well protected due to the fact that they are in public ownership. The "areas with potential for exceptional coastal experience" are broader in extent and include some private land, although again substantial areas are within State Parks or the Oregon Dunes National Recreation Area. Conflicts are considered most likely to occur:

- On the coastline in the Whiskey Run area and South of the City of Bandon. A 'Recreation' designation is proposed in the Whiskey Run area, and a "Controlled Development" designation within the urban growth area south of Bandon.

The land around Whiskey Run is part of a very extensive ownership which may ultimately be developed as a recreational planned unit development. The immediate coastal bluff could be required to be retained for its open space and scenic values during Planning Commission review of any proposal in this area. The Bandon U.G.A. coastal section is protected by the controlled development designation, which specifically provides for a site plan review to protect scenic resources. The Coastal Shorelands goal in any case restricts most types of development in rural areas, and this alone should adequately protect coastal scenic resources.

Where development is otherwise permitted in a scenic area, a site plan review can be required to ensure that the resource is adequately protected. It should be mentioned that logging and other forest management activities are regulated by the Forest Practices Act. The County has no powers to regulate the impact of forest management on scenic resources, whether inland or in coastal areas, (see Attorney General's opinions #7894 and #7910), if forest management is a "primary use" in the applicable zone.

The Oregon Department of Forestry is required by Goal #17, Implementation Requirement 1 to develop forest management practices and policies which protect special shoreland values, but this has not yet been done.

TABLE 2

Ownership and Land Use Conflicts for "Outstanding Scenic Resources"

SITE	OWNERSHIP	DEGREE OF PROTECTION	EXISTING OR POTENTIAL LAND USE CONFLICTS
Cape Arago	State (Parks Dept. ODOT)	Good	No known conflicts; Coast Guard maintains lookout on site
Coos Head	Federal		
Coquille River Falls	Federal (U.S. Forest Service)	Good	None; part of Coquille River Falls Natural Research Area
Coquille Point & offshore island	County (Point) & Federal (islands)	Good	No known conflicts; islands are protected under USFWS Oregon Islands National Wildlife program and Point is a County-owned park
Golden & Silver Falls	State (Parks Dept.)	Good	No known conflicts
Gregory Point	Federal	Good	No known conflicts
Mt. Bolivar	Federal	Good	No known conflicts
Shore Acres	State (Parks Dept.)	Good	None
Sunset Bay	State (Parks Dept.)	Good	None
Yoakum Point	State (Parks Dept.)	Good	None

EXHIBIT S
HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES
345-021-0010(1)(S)

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FIGURES

APPENDIX

1.0 INTRODUCTION

OAR 345-021-0010(1)(s). *Information about historic, cultural, and archaeological resources. Information concerning the location of archaeological sites or objects may be exempt from public disclosure under OAS 192.502(4) or ORS 192.501(11). The applicant shall submit such information separately, clearly marked as "confidential," and shall request that the Department and Council keep the information confidential to the extent permitted by law. The applicant shall include information in Exhibit S or in confidential submittals providing evidence to support a finding by the Council as required by OAR 345-022-0090.*

This Exhibit summarizes information collected about historical, cultural, and archaeological resources within the South Dunes Power Plant (SDPP) site boundary. The SDPP analysis area for Exhibit S is the site boundary and is shown in Figure S-1, delineated by the blue line boundary. The total area encompassed by the site boundary is 137.86 acres. Jordan Cove Energy Project, L.P. is the Applicant for the site certificate for the SDPP.

To identify historic, cultural, and archaeological resources within the site boundary, the Applicant contracted for a records review followed by field surveys. The results of these works are summarized in "Technical Memorandum, South Dunes Power Plant Cultural Resources, EFSC Filing, Oregon Department of Energy," by R. Scott Byram, PhD, November 7, 2013, updated October 2014, included with the confidential materials submitted with this exhibit.

Records review were conducted by R. Scott Byram, PhD, and included the area within and near the site boundary. The field survey was conducted within the analysis area. The cultural resource surveys conducted in the SDPP analysis area and the methodologies used in each are shown on Figures S-1 and S-2, respectively.

It should be noted that general site improvement activities will occur within the site boundary prior to construction of the SDPP to prepare the site for industrial development. These site improvement activities, which are separate from and not related to the request for a site certificate for the SDPP include: clearing brush, stripping topsoil, removal of peat and clay pockets, ground improvements, and placing fill within the site boundary.

A more detailed description of the methods and results of the cultural resource surveys can be found in the cultural resource technical reports on file at the State Historic Preservation Office (SHPO). These reports are confidential and exempt from public disclosure under Oregon Revised Statute (ORS) 192.501(11) to prevent public disclosure of protected archaeological site location information.

Consultations in conformance with the Project Order were held by archaeological consultants for the Applicant with the following Indian Tribes, as designated for the project by the Legislative Commission on Indian Services:

- The Confederated Tribes of Siletz Indians

- Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
- The Coquille Indian Tribe

Correspondence as evidence of that consultation is contained in Confidential Documents 2, 3, 4, and 5 filed with this exhibit. These documents are confidential because in some cases they mention the location of possible historic or cultural resources.

The sections that follow describe the Historic and Cultural Resources listed or possibly eligible for listing on the National Register of Historic Places, resources on private land within the analysis area, resources on public land within the analysis area, the potential impacts of the facility on historical, cultural, and archaeological resources and the proposed monitoring program. The conclusion of the cultural and archaeological surveys is that construction and operation of the SDPP are not likely to result in significant adverse impacts to historic, cultural, or archaeological resources that have been listed on, or would likely be listed on the National Register of Historic Places. This Exhibit and the attached cultural resource reports in the confidential documents provide evidence to support a finding by the Council as required by Oregon Administrative Rule (OAR) 345-022-0090.

2.0 HISTORIC AND CULTURAL RESOURCES LISTED OR POSSIBLY ELIGIBLE FOR LISTING

OAR 345-021-0010(1)(s)(A). *Historic and cultural resources within the analysis area that have been listed, or would likely be eligible for listing, on the National Register of Historic Places.*

No historic or cultural resources listed, or likely to be eligible for listing, on the National Register of Historic Places (NRHP) were discovered within the analysis area. Any historic or cultural resources that may have been identified near the analysis area are described within the confidential reports summarized in confidential documents submitted with this application and on file at the SHPO.

3.0 RESOURCES ON PRIVATE LANDS WITHIN THE ANALYSIS AREA

OAR 345-021-0010(1)(s)(B). *For private lands, archaeological objects, as defined in ORS 358.905(1)(a), and archaeological sites, as defined in ORS 358.905(1)(c), within the analysis area.*

Archaeological objects or archaeological sites that may have been identified near the analysis area are described within the confidential reports summarized in confidential documents submitted with this application and on file at SHPO. These include the seven cultural resource studies which are listed in Confidential Document 1 Cultural Resources Report - Table and List. For a detailed discussion of objects found refer to Confidential Documents 6 and 7.

4.0 RESOURCES ON PUBLIC LANDS WITHIN THE ANALYSIS AREA

OAR 345-021-0010(1)(s)(C). *For public lands, archaeological sites, as defined in ORS 358.905(1)(c),within the analysis area.*

The analysis area is located entirely on private lands and this criterion applies to public lands, therefore this criterion is not applicable to the SDPP site certificate application.

5.0 POTENTIAL IMPACTS OF THE FACILITY ON HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

OAR 345-021-0010(1)(s)(D). *The significant potential impacts, if any, of the construction, operation and retirement of the proposed facility on the resources described in paragraphs (A), (B) and (C) and a plan for protection of those resources that includes at least the following: (i)*

No historic or cultural resources listed on the NRHP, or likely to be listed, have been discovered in archaeological surveys within the analysis area. Archaeological objects or sites that may have been discovered will have been evaluated in accordance with state cultural resource regulatory statutes. Because NRHP-eligible resources have not been discovered, there are no anticipated impacts to resources from construction, operation, and retirement of the SDPP. According to all seven cultural resource investigations, including the two most recent investigations, completed in the winter of 2013 and summer of 2014, no cultural resources have been identified to date that would be eligible for listing on the National Register of Historic Places. In addition, the investigations report that no significant archaeological deposits within the SDPP site boundary were found during testing.

5.1 METHODOLOGY

OAR 345-021-0010(1)(s)(D)(i). *A description of any discovery measures, such as surveys, inventories, and limited subsurface testing work, recommended by the State Historic Preservation Officer or the National Park Service of the U.S. Department of Interior for the purpose of locating, identifying and assessing the significance of resources listed in paragraphs (A), (B) and (C).*

As shown in Figures S-1 and S-2, surveys have covered the entire SDPP site boundary, except in wetlands. Figure S-1 identifies the 8 areas of facilities within or adjacent to the analysis area. These are: (1) the Southwest Oregon Resource Security Center (SORSC) area (non-jurisdictional); (2) Gas Processing Area (non-jurisdictional); (3) Parking; (4) Pacific Power Substation Area; Construction law-down Area; (5) Pacific Connector Gas Metering Area; (6) Pacific Connector Gas Metering Area; (7) Stormwater Ponds; and (8) Barge Berth. The shading corresponds to the five archaeological surveys undertaken in the analysis area (Byram 2006, JCEP Survey and Addendum; Byram and Purdy 2007, OGMT Survey; Bowden et al. 2009, PCGP Survey; Byram and Shindruk 2012, Utility Corridor; and Byram 2013, JCEP Areas Survey).

These surveys have discovered no significant historic or cultural resources within the site boundary. Two types of surveys were completed: (1) pedestrian surveys and (2) surveys with shovels, probes, and/or augers. Figure S-2 identifies the areas in which pedestrian surveys were used, and the areas in which surveys with shovels, probes and/or augers were used.

Pedestrian surveys were completed where the surface was visible (vegetation-free) or could not be easily penetrated. This consisted of armored areas (disturbed sediments or limited probe access), high dune areas, and intertidal areas.

Subsurface surveys completed with shovels, probes and/or augers were completed in areas, aside from high dunes, where the ground could be penetrated. These surveys consisted of shovel probing to depths from 50-70 cm below surface, and in some areas deeper auger probing to as much as 3.5 meters depth. Probe intervals varied from 15 meters to 30 meters.

When designing and implementing surveys as well as other discovery measures, SHPO was consulted to provide recommendations. The following are summaries of advice letters from SHPO:

- On March 24, 2006, SHPO responded to a letter from Mr. Bob Braddock, JCEP Project Manager, advising Mr. Braddock to hire a qualified archaeologist to conduct cultural surveys of the JCEP site. This advice was followed, as evidenced by the cultural surveys conducted by qualified archaeologists that are cited and included in the confidential reports filed with the SHPO and in the technical memorandum summarizing those reports filed as a confidential document with this exhibit.
- On October 2, 2006, SHPO responded to R. Scott Byram, PhD, consulting archaeologist for JCEP, acknowledging the submittal of a cultural survey, including a portion of the SDPP site and providing 23 recommendations for improving the survey and report. On October 26, 2006, Dr. Byram responded to this letter with an addendum to the cultural survey.
- On October 3, 2006, SHPO responded to Ms. Janet Robins, of the Dickstein Shapiro law firm in Washington, DC (FERC counsel for Jordan Cove Energy Project), regarding draft Resource Report 4, for inclusion in the Federal Energy Regulatory Commission (FERC) application for JCEP's LNG import facility, which included a portion of the SDPP site. The letter made 18 recommendations regarding the draft Resource Report and the Unanticipated Discovery Plan.
- On November 21, 2006, SHPO again wrote to Ms. Robins (above) regarding a new draft Resource Report 4 submitted to SHPO. The letter stated that SHPO "agreed with the presentation set out in the Resource Report," and made five further recommendations.
- On December 26, 2007, SHPO wrote to Mr. David Kennedy of David Evans & Associates in response to "The Cultural Resources Survey for the Oregon Gateway Marine Terminal Stockpile Area at Coos Bay, Oregon" submitted to SHPO on September 13, 2007. This report covered the main part of the SDPP site. The Oregon State Historic Preservation Office agreed that there would be no adverse effect on known sites, but cautioned about work that might occur near a recorded site.
- On September 25, 2009, SHPO wrote Mr. Paul Friedman of FERC regarding the "Pacific Connector Gas Pipeline Project Cultural Resources Survey, Coos, Douglas, Jackson, and Klamath Counties, Oregon," which, among many other sites, covered much of the haul

road and the southern portion of the SDPP site. The study included a spreadsheet analyzing multiple potential sites for cultural resources, none of which are within the SDPP site.

- On October 30, 2012, SHPO wrote R. Scott Byram, PhD, in response to the submittal of the archaeological survey report of the proposed utility corridor. The letter stated that SHPO agreed that the project (the utility corridor) "would have no effect on any known cultural resources." The letter offered recommendations in the event that archaeological resources are discovered during project development.
- On January 13, 2014, SHPO wrote to Chris Green, Oregon Department of Energy Staff in response to a request for comments on the SDPP application for a site certificate. SHPO responded that additional areas needed to be surveyed before SHPO could complete review their review of project effects. These surveys are addressed in the reports included as Confidential Documents 6 and 7.

The correspondence cited above is included in Confidential Document 5 submitted with this exhibit to the Oregon Department of Energy staff.

OAR 345-021-0010(1)(s)(D)(ii). *The results of discovery measures described in paragraph (i), together with an explanation by the applicant of any variations from the survey, inventory, or testing recommended.*

The results of the cultural resource surveys are documented in the cultural resource report table and list provided in Confidential Document 1. Survey work was carried out and reported to SHPO in accordance with the recommendations from SHPO (two reports are pending recommendations from SHPO). No significant cultural resources have been discovered within the site boundary as a result of the surveys described in this exhibit. The discovery measures were completed as recommended by SHPO, no variations were used when performing the discovery measures.

Methods for the pre-construction cultural resource survey included consultations, a records review, and subsequent field survey. The results of these efforts are summarized in "Technical Memorandum, South Dunes Power Plant Cultural Resources, EFSC Filing, Oregon Department of Energy," by R. Scott Byram, PhD, November 7, 2013 (updated October 2014), included as Confidential Document 2 submitted with this exhibit.

5.2 RECORDS REVIEW AND CONSULTATIONS

The Applicant's consultant conducted a records review at the Oregon SHPO in Salem, reviewing reports and forms associated with previous archaeological and historical studies to determine whether buildings, structures, districts, objects, or archaeological resources had been previously recorded within the site boundary and its vicinity. The literature review also included regional and local environmental histories, ethnographic studies, and documents pertaining to local EuroAmerican history. The results of the records review are summarized in the technical memorandum included with the confidential documents filed with the Oregon Department of Energy concurrent with this application.

Consultations were held with SHPO and three Indian Tribes: (1) the Confederated Tribes of the Coos, Lower Umpqua & Siuslaw Indians, (2) the Coquille Indian Tribe, and (3) the Confederated Tribes of the Siletz Indians. These organizations received copies of the project Notice of Intent (NOI).

The results of the surveys are described in Confidential Documents 2, 6, and 7. Any sites discovered near the areas to be disturbed but outside the site boundary will be monitored during construction to ensure they are either not disturbed or that approved procedures are followed.

5.3 MITIGATION MEASURES

OAR 345-021-0010(1)(s)(D)(iii). *A list of measures to prevent destruction of the resources identified during surveys, inventories, and subsurface testing referred to in subparagraph (i) or discovered during construction.*

Archaeological consultants recommended that if any cultural resources are discovered during excavation and fill activities prior to the SDPP construction, work should be halted and the procedures outlined in the SDPP Unanticipated Discovery Plan, attached as Appendix S-1, should be followed.

6.0 PROPOSED MONITORING PROGRAM

OAR 345-021-0010(1)(s)(E). *The applicant's proposed monitoring program, if any, for impacts to historic, cultural and archaeological resources during construction and operation of the proposed facility.*

Construction personnel will be instructed as to the procedures for the following events: (1) in the event of discovery of unanticipated human remains or archaeological resources and (2) for protection of cultural sites that may be near the SDPP site but outside the site boundary. A cultural resources monitor will be identified within the construction and operations management, who will be made aware of any cultural resources within or near the site boundary, and his/her duty will be to ensure that the procedures outlined in the Unanticipated Discovery Plan, attached as Appendix S-1, are followed.

Figure S-1. Cultural Resources

Item	Description
1	SORSC
2	Gas Conditioning Processing Area
3	Parking
4	Pacific Power Substation Area
5	Construction Laydown Area
6	Pacific Connector Gas Metering Area
7	Stormwater Ponds
8	Barge Berth

N

0 450 900 Feet

1 inch = 900 feet

Data Sources: R. Scott Byram, Ph.D., R.P.A. and Sarah E. Purdy
Byram Archaeological Consulting, LLC
Eugene, Oregon

EFSC Site Boundary

Cultural Survey

- Byram 2006 (JCEP Survey and Addendum)
- Byram and Purdy 2007 OGMT Survey
- Bowden et al. 2009 PCGP Survey
- Byram and Shindruk 2012 (Utility Corridor)
- Byram 2013 JCEP Areas Survey
- Rose, Byram, Johnson 2014

South Dunes Power Plant Project

EFSC Application

EXHIBIT S
Figure S-1
Cultural Surveys

Date: 9/9/2014
Reviewed By BL
Designed By SAST

Figure S-2. Cultural Survey Methods

Item	Description
1	SORSC
2	Gas Conditioning Processing Area
3	Parking
4	Pacific Power Substation Area
5	Construction Laydown Area
6	Pacific Connector Gas Metering Area
7	Stormwater Ponds
8	Barge Berth

N

0 450 900 Feet

1 inch = 900 feet

Data Sources: R. Scott Byram, Ph.D., R.P.A. and Sarah E. Purdy Byram Archaeological Consulting, LLC Eugene, Oregon

EFSC Site Boundary

Cultural Survey Method

- Pedestrian Survey (due to armored dune surface)
- Shovel Probe/Auger Survey
- Not Surveyed (due to wetland proximity)

South Dunes Power Plant Project

EFSC Application

EXHIBIT S
Figure S-2
Cultural Survey Methods

Date: 9/9/2014
Reviewed By BL
Designed By SAST

APPENDIX S-1

Unanticipated Discovery Plan

South Dunes Power Plant

PLAN AND PROCEDURES ADDRESSING UNANTICIPATED DISCOVERIES OF CULTURAL RESOURCES AND HUMAN REMAINS

September 2014

I. INTRODUCTION

Jordan Cove Energy Project, L.P. (JCEP) is the Applicant for the South Dunes Power Plant (SDPP) site certificate from the Oregon Department of Energy (ODOE). This document outlines JCEP's procedure, to prepare for, and address any unanticipated cultural or archaeological discoveries. It provides direction to SDPP personnel and their consultants as to the proper procedure to follow in the event that unanticipated discoveries of historic properties or human remains are made during construction, operation, or retirement of the SDPP.

II. TRAINING AND ORIENTATION

JCEP will appoint an Environmental Inspector (EI), who will be responsible for advising construction contractor personnel on the procedures to follow in the event that an unanticipated discovery is made. The EI will work with an on-site archaeologist monitor, who will train the EI to identify or recognize cultural resources. Training will occur as part of the pre-construction on-site training program for foremen, company inspectors, and construction supervisors. The EI will advise all operators of equipment involved in grading, stripping, drilling, trenching, or other activities to:

A. **Stop work immediately if they observe any indications of the presence of cultural materials (artifacts or other man-made features), shell midden, animal bone, or possibly human bone.**

B. **Contact the EI (or the Chief Inspector at the site if the EI is not available) as soon as possible.**

C. **Comply with unanticipated discovery procedures.**

D. **Treat human remains with dignity and respect.**

III. PROCEDURE WHEN CULTURAL MATERIALS ARE OBSERVED

Cultural materials include man-made objects (prehistoric and historic period items) and features (e.g., walls constructed of natural materials such as cobbles; surfaces paved by cobbles, brick or other material; or other remnants of cultural activity). In the event of a discovery of any cultural resource, SDPP personnel will follow State of Oregon regulations and requirements, as outlined in Oregon Revised Statues (ORS) 358.905 to 358.955. The State Historic Preservation Office (SHPO) may recommend determinations of National Register of Historic Places (NRHP) eligibility. Treatment measures at affected NRHP-eligible sites may only be implemented after permission is received from SHPO (via email or letter).

A. **A.Stop work in the immediate vicinity of the observed cultural materials (including shell midden).**

   1. Notify the EI of the discovery.

2. If the EI believes that an unanticipated discovery has been made:

    a) The EI directs all ground-disturbing activities within 250 feet of the discovery to stop.

    b) The EI will protect and secure the evidence in place by delineating the find with flagging or fencing.

B. Minimize movement of vehicles and equipment in area immediately surrounding the discovery.

C. The EI will immediately notify the SDPP Construction Superintendent.

D. The SDPP Construction Superintendent will immediately notify the designated SDPP personnel and TRC Environmental Corporation (TRC) contacts by telephone with written confirmation (via email). All contacts are listed at the end of this document. (If primary contact cannot be reached, notify the indicated alternate.)

E. Within 24 hours, if possible, a professional archeologist will examine the location of the discovery, accompanied by the EI.

1. If the archeologist determines that the discovery is not a cultural resource, the archeologist will immediately advise the EI, the Chief Inspector and/or the SDPP Construction Superintendent, any of whom will have the authority to remove the stop-work order. The archeologist will submit a letter report including photographs of the discovery site to JCEP and TRC contacts within 15 business days.

2. If the archeologist determines that the discovery is a cultural resource, the archeologist will immediately advise the EI who will notify the ODOE, JCEP and TRC contacts listed at the end of this document. The TRC contact will notify the SHPO and the ODOE contact by telephone, with written confirmation by email.

3. If the discovery is aboriginal, JCEP will also notify appropriate Indian Tribe contacts listed at the end of this document. Notification will be by telephone, with written confirmation by fax and/or overnight mail. Notification will be the responsibility of JCEP.

F. Notifications to SHPO and ODOE about observations of cultural material will:

1. Explain why the archeologist believes the resource is or is not significant and request permission from ODOE for construction to recommence.

2. Describe a scope-of-work for evaluating the significance of the resource and evaluating potential Project effects on the resource. A request for authorization to immediately implement the work scope will also be made to ODOE.

3. Obtain the Archaeological Permit required under ORS 390.235, OAR 736-051-0080 through 0090.

4. Invite ODOE, SHPO and identified tribal representatives, when appropriate, to observe the implementation of any proposed work.

5. All work to evaluate significance and SDPP effects will be confined to the SDPP's potential area of impact.

G. When the evaluation of the cultural resources is complete:

1. JCEP will notify ODOE and SHPO by telephone and discuss the Project archeologist's opinion concerning the potential significance of the resource.

2. As soon as possible following the field investigation, the archeologist will provide SHPO, ODOE, and JCEP with a written report describing the results of the fieldwork.

3. If SHPO and interested Indian Tribes find that the resources are significant, the archaeologist will prepare a proposal for a treatment plan for review and approval by ODOE. Such treatment plans will only be implemented after permission is received from SHPO (via email or letter).

H. JCEP may choose to prepare an analysis of alternatives to data recovery to determine what form of mitigation is preferable.

1. If an alternatives analysis is conducted, JCEP will submit, by fax or overnight mail, the archeologist's report and the alternatives analysis to SHPO and ODOE.

2. If proposed mitigation measures may be carried out without being impeded or affected by construction, the submittal to SHPO and ODOE will be accompanied by a request that construction in the area of the discovery be permitted to resume.

I. Upon receipt of authorization from the ODOE, implementation of mitigation measures will begin immediately.

1. JCEP will advise SHPO and ODOE when all mitigation measures have been completed.

2. If construction has been halted, JCEP will also request authorization from ODOE to recommence construction.

3. JCEP will submit a summary report describing the results of mitigation to SHPO and ODOE within 30 days of notification that mitigation fieldwork has been completed.

4. If archeological data recovery is a component of the mitigation plan, a full report will be submitted to SHPO and ODOE in accordance with a schedule to be established in consultation with ODOE.

5. If reporting of any subsurface evaluation of identified sites and mitigation measures is required, it must be coordinated under the Archaeological Permit.

6. Copies of all reports will be sent to SHPO, the Legislative Commission on Indian Services, and all appropriate tribes.

IV. PROCEDURE WHEN HUMAN REMAINS AND/OR POTENTIALLY HUMAN SKELETAL MATERIALS ARE OBSERVED

Human remains are physical remains of a human body or bodies including, but not limited to, bones, teeth, hair, ashes, and preserved soft tissues (mummified or otherwise preserved) of an individual. Remains may be articulated or disarticulated bones or teeth. In the case of a discovery of human remains, JCEP will adhere to ORS 97.740 to 97.760, and notify ODOE, SHPO, State Police and other appropriate local officials (such as the county sheriff and county medical examiner). If the remains may be modern or the result of a crime, treatment would be determined by the State Police and local officials, and JCEP will notify ODOE and SHPO about the determinations of those agencies.

A. Workers will treat all human remains with dignity and respect.

B. Workers will immediately stop work in the vicinity of an unanticipated discovery involving potentially human remains.

C. Workers will immediately notify the EI about the find.

D. If the EI believes that potentially human skeletal remains have been found, the EI will stop all ground-disturbing activities within 250 feet of the potential discovery.

1. Protect and secure the evidence of the discovery.

2. Delineate the area with flagging or safety fencing.

3. Minimize movement by vehicles and equipment in the immediate vicinity of the discovery.

E. The EI will immediately notify the SDPP Construction Superintendent who will, in turn, immediately notify the designated contacts for SDPP, TRC, ODOE, SHPO, Oregon State Police, Coos County Sheriff, the landowner (if not JCEP), Legislative Commission on Indian Services, and the Indian Tribes.

F. Within 24-hours of the discovery, if possible, a professional archeologist will examine the discovery to determine if the remains are human and have an

archeological association and, if so, if that association is aboriginal or nonaboriginal.

1. The services of a physical anthropologist or other qualified professional will be retained if the archeologist is unable to determine if the remains are human.

G. If skeletal remains are determined to be non-human and there is no archeological association, the archeologist making the determination will immediately advise the EI and/or the SDPP Construction Superintendent, and construction may resume.

1. The archeologist will submit a letter report including photographs of the discovery site to JCEP and the TRC contacts within 15 business days of the determination.

H. If the skeletal remains are non-human but are associated with an archeological site, follow the steps described in Section III A through I.

I. If the skeletal remains are human and not associated with an archeological context, the SDPP Construction Superintendent will notify the designated contacts for the SDPP, ODOE, SHPO, the landowner (if not JCEP), State Police, Coos County Sheriff, Legislative Commission on Indian Service, and the Indian Tribes.

1. If the remains may be modern or the result of a crime, treatment would be determined by the State Police and local officials, and JCEP will notify ODOE and SHPO about the determinations of those agencies.

J. Human remains found in a prehistoric archeological context will be assumed to be aboriginal. If aboriginal human remains are identified (whether or not in an archeological context), JCEP will immediately notify the TRC Contact. TRC will then notify SHPO and ODOE. JCEP also will notify the Oregon Legislative Commission on Indian Services (OCIS), and the Indian Tribe contacts listed at the end of this document. JCEP will follow the procedures outlined in the State of Oregon and tribal position paper: "Treatment of Native American Human Remains Discovered Inadvertently, or Through Criminal Investigations on Private and Public, State-owned Lands in Oregon" (September 2006).

K. If human remains are present in an aboriginal archeological context, JCEP will follow the procedures described in Section III E through I, except as follows:

1. Notifications to ODOE and SHPO will make special note that human remains have been found.

2. JCEP will notify the Indian Tribe contacts, and request that identified tribal representatives advise JCEP, ODOE, and SHPO of any special desires they have regarding the disposition of the human remains.

3. Proposals for site evaluation will give special consideration to the fact that human remains are present.

   a) No intrusive examinations of the immediate area of the remains will be conducted prior to receipt of a permission from ODOE.

   b) The potential for the presence of multiple graves will be evaluated and procedures for determining if other unidentified graves may be present will be described.

   c) Efforts made to contact Indian Tribes will be described, the results of contacts, and efforts (as feasible) to accommodate the desires of the Indian Tribes regarding the treatment of human remains.

   d) If the discovery was made after excavation in the vicinity of the discovery has been completed, construction will be permitted to recommence, except within 100 feet of any human remains.

   e) Construction within the 100-foot area of the find will be permitted to proceed when the remains have been removed (or when ODOE advises JCEP that it has determined that the remains should be left in place).

4. If ODOE or SHPO advises JCEP that specific tribal representatives wish to take custody of any human remains and rebury them elsewhere, JCEP will, if requested, assist in any negotiations between the tribe and the landowner that may be necessary.

5. JCEP will make a good faith effort to accommodate any requests from identified tribal groups that they be present during the implementation of mitigation measures related to human remains. Subject to agreements with identified tribal groups, JCEP will offer to compensate a single tribal representative for time spent observing or participating in the removal of human remains. Compensation will include the individual's time (at an hourly rate equivalent to that paid the professional archeologist) and associated travel and living expenses.

6. JCEP will be responsible for the reburial costs of any human remains (not in crime scene) encountered during construction of the project.

L. If human remains are present in a non-aboriginal archeological context, the procedures described in Section IV E through J, will be followed except that:

1. If it is determined by SHPO, that the associated archaeological site is not eligible for the NRHP, the State Police's and Coos County Sheriff's offices will be requested to coordinate with the local medical examiner and either direct the archeologist to implement an approved plan for removal of the remains or arrange for alternative, appropriate removal of the human remains.

2. JCEP will make a reasonable effort to contact likely descendants. If those descendants request, JCEP will make arrangements with the owner of the

land where the remains were found (if the land owner is not JCEP) to allow for a site visit.

3. If the human remains are not modern or the result of a crime, JCEP will prepare a treatment plan, in consultations with ODOE, SHPO, interested Indian Tribes, or likely descendants. The treatment plan will outline measures, reached by consensus among the consulting parties, to be implemented, including addressing how the remains should be excavated, studied, repatriated, reinterred, and reported. Human remains and funerary objects will not be permanently curated.

4. Proposals for site evaluation will give special consideration to the fact that human remains are present (no intrusive examination of the immediate area of the remains; proposal will include an evaluation of the potential for the presence of multiple graves; and procedures for determining if other unidentified graves may be present will be described).

5. Within 15 business days of the resumption of construction, JCEP will provide ODOE with a written report describing the removal activities.

6. If the discovery was made after excavation in the vicinity of the discovery has been completed, construction will be permitted to recommence, except within 100 feet of any human remains.

M. The treatment measures for human remains will not be implemented by JCEP until after permission is received from the ODOE, and construction will not resume at a discovery location until after the measures are completed and ODOE issues notification.

Contacts for SDPP, Consultants Agencies, and Tribes

SDPP Contact
Robert L. Braddock
Jordan Cove Energy Project
125 Central Avenue, Suite 380
Coos Bay, OR 97420
Phone: (541)-266-7510
Fax: (541)-266-7510

Alternate SDPP Contact
To Be Determined

TRC Contact
Brian Thomas
TRC
4155 Shackleford Road, Suite 225
Norcross, GA 30093
Phone: (770) 270-1192
Fax: (770) 270-1392

Alternate TRC Contact
To Be Determined

ODOE Contact
Andrea Goodwin
Oregon Dept. of Energy

Alternate ODOE Contact
To Be Determined

625 Marion St. NE
Salem, OR 97301-3737
Phone: 503-373-0076
FAX: 503-373-7806
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EXHIBIT T
RECREATION
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Appendix T-2 Memorandum from Frank Whipple Regarding Restricted Areas

1.0 INTRODUCTION

OAR 345-021-0010(1)(t). *Information about the impacts the proposed facility would have on important recreational opportunities in the analysis area, providing evidence to support a finding by the Council as required by OAR 345-022-0100.*

The analysis area for impacts to recreational opportunities includes the area within the South Dunes Power Plant (SDPP) site boundary and extends 5-miles beyond the facility boundary, as shown on Figure T-1. Recreational opportunities within the five-mile analysis area (including those addressed in the discussion of protected areas in Exhibit L of this Application) include upland activities like: camping, hiking, beachcombing, wildlife viewing, cycling, off-road recreational vehicle (ORV) use, and horseback riding. Water-based recreation activities include: fishing, shellfish harvesting, and boating on Coos Bay. The SDPP site and related transmission line are located on private land zoned industrial by Coos County.

The area within the site boundary is privately owned, and it contains no state, county, or federally designated lands or otherwise special designation or management of land or recreational facilities. While the site is entirely private property, a local resident reported that some individuals have trespassed onto the site to fish in Coos Bay from the bank.[1] No recreational activities will be allowed within the site boundary during project construction or operation.

Identified important recreational opportunities will be described and discussed for potential impacts resulting from the facility in this Exhibit.

[1] Conversation with Barbara Gimlin, April 3, 2014.

2.0 IMPORTANT RECREATIONAL OPPORTUNITIES IN THE ANALYSIS AREA

OAR-345-021-0010 (1)(t)(A). *A description of the recreational opportunities in the analysis area that includes information on the factors listed in OAR 345-022-0100(1) as a basis for identifying important recreational opportunities.*

OAR 345-022-0100 lists criteria used to determine whether a recreational opportunity is important, the criteria are: any special designation or management, degree of demand, outstanding or unusual qualities, availability or rareness, and irreplaceability or irretrievability of the opportunity. Based on consideration of those criteria, the following recreational opportunities within the analysis area were identified for further investigation:

- Oregon Dunes National Recreation Area
- Siuslaw National Forest—Horsfall Area
- Oregon Shore State Recreation Area
- Conde B. McCullough State Recreation Site
- Oregon Coast Bike Route
- Coos Bay Estuary
- Coos Bay Shorelands, including the North Spit and the Weyerhaeuser North Spit Overlook
- City Parks (Cities of Coos Bay and North Bend)

A summary table of recreational opportunities and information on the factors listed in OAR 345-022-0100 is provided as Table T-1. A recreational opportunity is regarded as “rare,” if a similar opportunity is not available within a few hours’ drive of the Coos Bay area. An opportunity is “irreplaceable,” if it presents a unique ecosystem or unique recreational opportunities that cannot be recreated elsewhere where Coos Bay area residents might visit. These two factors go into the consideration of whether a recreational opportunity is “important,” in addition to any official designation or management of the opportunity and the degree of demand.

Table T-1. Summary of Recreational Opportunities Evaluation

Recreational Opportunity	Approximate Distance from the Site Boundary	OAR 345-022-0100 Criteria					Important?
		Special Designation / Management	Degree of Demand	Outstanding / Unusual Quality	Availability / Rareness	Irreplaceability / Irretrievability	
Oregon Dunes National Recreation Area	1 mile	U.S. Forest Service Siuslaw National Forest	Very high	Largest expanse of coastal sand dunes in North America. Provides hiking, camping, fishing, horseback riding, and ORV use.	Rare	Irreplaceable	Yes
Siuslaw National Forest Horsfall area	Less than 1 mile	Siuslaw National Forest	Moderate	Hiking, camping, horseback riding, picnicking, fishing.	Rare	Irreplaceable	Yes
Oregon Shore State Recreation Area	1 mile (from transmission line)	Oregon Parks Department	High	Beachcombing, bird-watching, hiking, surfing.	Rare	Irreplaceable	Yes
Conde B. McCullough State Recreation Site	1 mile	Oregon State Parks	Low	Vegetated shoreline along Coos Bay. Picnicking is primary use.	Common	Replaceable	No
Oregon Coast Bike Route	1.7 miles	Oregon Department Of Transportation & Oregon State Parks	High	Bicycle travel along Highway 101.	Rare	Irreplaceable	Yes
Coos Bay Estuary	Adjacent to site	Oregon Department of State Lands & U.S. Army Corps of Engineers	High	Boating, fishing, clamming, oystering, hunting.	Somewhat rare	Irreplaceable	Yes
North Spit Overlook	1 miles	Weyerhaeuser Company	Low to Moderate	Sightseeing, walking, bird-watching, nature study.	Somewhat rare	Replaceable	No
Coos Bay Shorelands, including the North Spit	Various	Bureau of Land Management, various portions designated Special Recreation Management Area or Area of Critical Environmental Concern	High	Hiking, fishing, nature study, bird-watching, boat-launching, horseback riding, ORV use.	Somewhat rare	Irreplaceable	Yes
City Parks	Various	City of North Bend & City of Coos Bay	High	Swimming, organized sports, hiking, boating, playgrounds, nature study.	Somewhat rare locally	Somewhat replaceable	Yes two parks meet criteria for "important": John Topits Park and the Historic Hollering Place
Motor Camping	Various	Private ownership	Seasonally high	Hook-ups for RVs.	Common	Replaceable	No

The SDPP site is located approximately 1 mile from the Oregon Dunes National Recreation Area[2] (managed by the United States Forest Service [USFS] Siuslaw National Forest) and the Coos Bay Shorelands (managed by the Bureau of Land Management [BLM]). The SDPP is immediately adjacent to the Coos Bay estuary. These identified recreation opportunities, among others within the analysis area, are described and assessed for their relative importance below. The SDPP site boundary, the 5-mile analysis area, and identified recreational areas are mapped on Figure T-1.

2.1 RECREATIONAL OPPORTUNITIES AND FACILITIES ON STATE AND FEDERAL LANDS

2.1.1 Oregon Dunes National Recreation Area/Siuslaw National Forest

This recreational area is a very diverse and productive region along the Oregon coast. The National Forest encompasses over 630,000 acres of unique and varying ecosystems; Coos County includes 11,000 acres of the National Forest. Over one million recreation visitors were recorded in 2011. Visitors have many recreational opportunities, including scenic mountain views, beach combing, whale watching, exploring and hiking the forest or dunes, swimming, camping, fishing, and dune buggy and horseback riding.

The USFS, Siuslaw National Forest manages the Oregon Dunes National Recreation Area (Oregon Dunes NRA). Oregon Dunes NRA stretches approximately 40 miles between Florence to the north and Coos Bay to the south and is the largest expanse of coastal sand dunes in North America. The average width of the recreational area is 1.5 miles. The southern boundary of Oregon Dunes NRA is one mile north of the SDPP site boundary. The segment of Oregon Dunes NRA within the analysis area is intensively used for motorized recreation in off-trail areas by dune buggies, motorcycles, and other ORVs. Non-motorized recreation opportunities are also available, including hiking, wildlife viewing, beachcombing, and horseback riding in areas not dominated by ORV use. This area also contains lakes and ponds, and numerous streams providing opportunities for sailing, canoeing, water-skiing, swimming, scuba diving, and fishing. The day-use and overnight camping facilities of the entire Oregon Dunes NRA are visited by over 400,000 visitors per year. Hunting areas, administered by the Oregon Department of Fish and Wildlife (ODFW), occur in the Siuslaw National Forest, and includes big game (i.e., deer and elk), waterfowl, and fur-bearing animals.

Public access to Oregon Dunes NRA within the analysis area is gained at the community of Hauser or from the south via US 101 to TransPacific Parkway and then into the recreation area via Horsfall Beach Road.

The public lands south of Horsfall Beach Road and north of the TransPacific Parkway are outside the Oregon Dunes NRA but are administered by the Siuslaw National Forest and are reserved for non-motorized recreation, such as hiking, horseback riding, and picnicking.

[2] Some maps show the southern boundary of the Oregon Dunes NRA extending to the TransPacific Parkway, including the Horsfall Area; the boundary is actually along the southern limits of townships 28 and 29, about one mile north of the SDPP site. *Oregon Dunes NRA Management Plan,* July, 1994, p. II-7

The Oregon Dunes NRA is a unique landscape. Nowhere else in the United States is there such an extensive coastal dune system. While there are other coastal dune sites in North America, none is so large or presents so many varied recreational opportunities. These factors, as well as the intensive visitor usage, make the Oregon Dunes NRA an important, rare, and irreplaceable recreation facility.

The Forest Service lands outside of the Oregon Dunes NRA in the Horsfall area, south of the Oregon Dunes NRA and north of TransPacific Parkway are less unique, but nonetheless important. The Horsfall area includes four public campgrounds (Horsfall Sand Camp, Bluebill Camp, Wildmare Horse Camp, and Horsfall Beach Camp) as well as staging areas for off-road vehicle use on the north side of Horsfall Road. Wildmare Horse Camp allows for horseback riding access to the Forest Service lands between Horsfall Road and the TransPacific Parkway. There is one picnic area, the Sandtracks Picnic Area. Off-road vehicle riding is prohibited south of Horsfall Beach Road.

Forested lands and beach access are common west of the Coast Range. However, the wild nature of the Horsfall lands and their inclusion within the dune ecosystem and Oregon Dunes NRA recreational management area make them rare and irreplaceable. The opportunity for dune camping, while present in the Oregon Dune NRA itself, is a rare recreational opportunity for those with vehicles to access these camping areas.

2.1.2 Oregon Shore State Recreation Area

All beaches in Oregon up to the vegetation line are public property and are managed by the Oregon Parks Department. The beach areas within the analysis area present uninterrupted views along the coast, without headlands, and compared to many other beaches in Oregon have no adjacent development. Road access within the analysis area is available only from the TransPacific Parkway and Horsfall Beach Road. Due to these unique characteristics, the Oregon Shore State Recreation Area within the analysis area is characterized as rare and irreplaceable, contributing to its status as an important recreational opportunity.

2.1.3 Conde B. McCullough State Recreation Site

The 23-acre recreational site begins at a turnoff to North Bay Road near the north end of the historic McCullough Memorial Bridge and is located about one mile east of the northeast corner of the SDPP site. It presents a narrow, long, steep, vegetated natural shoreline between Coos Bay and houses on the other side of North Bay Road. There is limited to no recreational opportunities at this site, facilities being limited to one picnic table at a wayside at its far eastern end. No camping is allowed, and there is no boat ramp to provide access to the bay. Views to the bay from the road are obscured by vegetation in most places. Many other sites along Coos Bay provide better recreational opportunity, such as the BLM lands on the North Spit and the numerous boat ramps located around Coos Bay. The site is used primarily as a highway wayside and for picnicking. Other than its shoreline location, this strip of land presents no unusual characteristics that would not be available in many parks and other public lands in the Coos Bay area.

As a result of this analysis, the recreation site is classified as common and replaceable.

2.1.4 Oregon Coast Bike Route

The Oregon Coast Bike Route is a 370-mile signed bike route enjoyed by thousands of bicyclists annually. For the most part, it follows U.S. Highway 101 as a shoulder bikeway. At the intersection of U.S. Highway 101 and the Trans-Pacific Parkway, the route is at its closest approximately one mile east of the SDPP site. Opportunities for impressive views occur along this segment of U.S. Highway 101; the open waters of Coos Bay with the forested sand dunes and hillsides as a backdrop and the notable McCullough Memorial Bridge in the distance. From the bridge itself there are expansive views of the waters of Coos Bay and the North Spit, as well as the City of North Bend. In several areas, the route departs from the main highway and follows county roads and city streets. This occurs in North Bend where bicyclists follow the North Bend Bypass. This route allows bicyclists to avoid heavy commercial and truck traffic on U.S. Highway 101 through North Bend and Coos Bay. The bypass passes south of Pony Slough on Virginia Avenue and turns south on Broadway Street. At this location, the route is approximately 1.7 miles south of the SDPP site. At Newmark Avenue (Cape Arago Highway), the bypass turns west and continues to South Empire Boulevard where it continues south to Charleston crossing the South Slough Bridge. Leaving Charleston, the bypass turns south on Seven Devils Road. Opportunities to camp and sightsee occur off the main bike route along the coast front. There are very few views of the SDPP site once the bicycle route leaves U.S. Highway 101.

The Oregon Coast Bike Route in the area east of the SDPP site boundary and across the McCullough Bridge presents a panorama of stunning views at the pace of a bicycle. There are other areas of the West Coast with views of bays and dunes from coastal highways along U.S. Highway 101 in Oregon, Washington, and California, and Highway 1 in California. However, the Oregon Coast Bike Route within the analysis area presents rare views of dunes, an estuary, a high bridge, and cityscapes, all in one. Nowhere else on the Oregon Coast is this opportunity available. Therefore, the Oregon Coast Bike Route is considered a rare, irreplaceable, and important recreational opportunity.

2.1.5 Coos Bay Estuary

The SDPP site boundary borders the Coos Bay estuary, which encompasses all the waters of Coos Bay, including the water body known as Jordan Cove, west and south of the site. The Coos Bay estuary covers 54 square miles of open channels and periodically flooded tidal flats. Submerged waters and tidelands in Coos Bay are the property of the state and managed by the Oregon Department of State Lands (DSL). The U.S. Army Corps of Engineers (USACE) is responsible for maintenance of the Coos Bay navigation channel.

The estuary is heavily used for recreational boating, angling, clamming, and crabbing. Clamming occurs at Haynes Inlet. Recreational crabbing occurs throughout the lower and mid-bay.

The Coos Regional Trails Partnership, a loose consortium of land management agencies and economic development entities, developed a brochure that maps Coos Bay water trails where canoeists and kayakers can enjoy the sloughs, bay islands, and rivers draining into Coos Bay (Appendix T-1). The water trails closest to the SDPP site are approximately one mile northeast in North Slough and Haynes Inlet east of the railroad bridge that crosses Coos Bay. The brochure does not identify Jordan Cove or the section of Coos Bay south of the SDPP site as part of the water trail system.

The Oregon Department of Fish and Wildlife distributes a map showing recreational shellfish areas along the shores of Coos Bay (Appendix T-1). Clamming opportunities occur within the intertidal portions of Coos Bay, including along the Trans-Pacific Parkway where the road crosses Haynes Inlet near U.S. Highway 101. Additional description of recreational fisheries is provided in Exhibit P.

Recreational opportunities on Coos Bay, such as fishing, boating, and shellfish harvesting can be found elsewhere on the Oregon Coast. However, Coos Bay presents opportunity for all these activities to a high degree of quality. Outside the analysis area in Coos Bay there does exist opportunity for boating and nature-viewing in the South Slough Estuary, and fishing is available in other estuaries on the Oregon Coast, but the Coos Bay estuary within the analysis area is much larger than all others, except the Columbia River Estuary. Therefore, recreational opportunities on Coos Bay are considered somewhat rare. Because additional estuaries cannot be created, the opportunities are considered irreplaceable. In addition, the high volume of recreational usage adds to the consideration of Coos Bay as an important recreational resource.

2.1.6 Coos Bay Shorelands, including the North Spit

The Coos Bay Shorelands extend from Florence (about 49 miles north of project area) to the mouth of Coos Bay, and includes approximately 3,750 acres within the planning boundaries, and 1,700 acres in the public domain. In addition to the lands on the North Spit of Coos Bay, the Coos Bay Shorelands planning boundaries include approximately 90 acres at Coos Head above the south jetty of Coos Bay (outside the analysis area). The biological and recreational resources of the Coos Bay Shorelands are similar in character to the Oregon Dunes National Recreation Area. The Bureau of Land Management has managed the Coos Bay Shorelands since 1984. In the Coos Bay District Final Resource Management Plan,[3] the Coos Bay Shorelands is designated as a Special Recreation Management Area, and the southern portion of the North Spit is designated an Area of Critical Environmental Concern.[4] Under this plan, the Coos Bay Shorelands will be managed as a mainly natural area with conservation of botanical, cultural and wildlife resource values while providing educational, interpretive, and recreational opportunities for the benefit of local and regional visitors and economies.

The North Spit of Coos Bay is a strip of land between the Pacific Ocean and the waters of Coos Bay. This peninsular area can be characterized as containing both industrialized and semi-natural areas. According to the BLM Final North Spit Plan, the public lands managed by the BLM on the North Spit are destined to become the largest and most accessible tract of public open space closest to the Coos Bay area communities.[5] In recognition of the area's value for outdoor recreation, the federal lands on the North Spit were designated as a Special Recreation Management Area in the Coos Bay District Resource Management Plan.[6] Recreation facilities include a boat launch facility and courtesy dock approximately 2.5 miles southwest of the SDPP site that provides access to the Coos Bay estuary. During federal fiscal year 2004, 9,774 visitor

[3] *Coos Bay District Record of Decision and Resource Management Plan*, May, 1995
[4] Ibid, p.38
[5] BLM *Final North Spit Plan, An Update to the Coos Bay Shorelands Plan of 1995,* December, 2006, p. 52.
[6] *Coos Bay District Record of Decision and Resource Management Plan*, May, 1995, p.49

days were counted on the North Spit, including 420 boats launched from the boat ramp.[7] The Special Recreation Management Area includes 1,600 acres for off-highway vehicle use along designated sand roads. These roads are also available to hikers and equestrians. Hunting on the North Spit is managed by ODFW and includes big game and waterfowl. Surfing is also an important recreational activity in the ocean along the North Spit.

The Coos Bay Shorelands within the analysis area that present recreational opportunities are those public lands located on the North Spit.[8] Private lands on the North Spit and elsewhere in the Coos Bay Shorelands are not available for recreation, unless specially designated. The Bureau of Land Management's plans for the North Spit are focused on providing broad recreational opportunities (including motorized recreation) while maintaining the natural values of the spit.[9] While the scenic, cultural, and recreational resources on the North Spit are significant, they are not unique. Similar recreational opportunities exist in the Oregon Dunes NRA and on other ocean spits in Oregon. However, for Coos Bay area residents, this is the closest opportunity for recreation on land between the ocean and estuary. Therefore, the North Spit Coos Bay Shorelands lands will be considered important, somewhat rare and irreplaceable.

2.2 COOS COUNTY RECREATIONAL OPPORTUNITIES AND FACILITIES

There are no Coos County parks within the analysis area.[10]

2.3 CITIES OF NORTH BEND AND COOS BAY RECREATIONAL OPPORTUNITIES AND FACILITIES

The City of North Bend has over 60 acres of parks and park land. The City of North Bend parks include:[11]

- Airport Heights Park
- Boynton Park
- California Street Boat Ramp
- College Park
- Ferry Road Park
- Oak Street Park
- Simpson Park
- State Street Park
- Winsor Park

[7] BLM Final North Spit Plan, p. 53.
[8] The 80 acre BLM parcel west of Jordan Cove Road, south of the TransPacific Parkway, and north of the SDPP utility corridor is part of the SRMA, but there are no recreational facilities or designated trails on the parcel. It is used informally by off-road vehicles.
[9] BLM North Spit Plan, pp. 6-9
[10] It has been determined through GPS measurements that Riley Ranch Park is outside the analysis area.
[11] http://www.northbendcity.org/North_Bend_Oregon_Parks.htm. Accessed October 26, 2014.

Boynton, College, Oak Street, and State Street Parks are small, typical neighborhood parks providing open space and some sports facilities and children's play structures. Ferry Street, Simpson, and Winsor Parks form a network of forested open space at the north entrance to North Bend on either side of Hwy 101, where walking and picnicking opportunities are available. The California Street Boat ramp provides access to the waters of Coos Bay for recreational boaters. The nearest facilities to the SDPP are Simpson Park and Airport Heights Park, which is approximately 1 mile south of the SDPP site across the bay. Airport Heights Park is located on the south side of the Southwest Oregon Regional Airport and is the most developed of the North Bend Parks, with tennis courts, baseball/softball fields, and playground equipment.

Of the identified North Bend parks, none can be considered "important" using the factors listed in OAR 345-022-0100(1)(a)-(e). The developed park facilities at Airport Heights Park are relatively uncommon for the Coos Bay area, but they can easily be replaced at other locations as the amenities themselves (tennis courts, baseball fields, and playground equipment) are not irreplaceable, are not unusual, and are readily available through purchase or design. In addition, none of the North Bend parks are considered "important" because the aforementioned parks are typical urban parks and facilities, common and replaceable, and do not possess any unusual qualities.

The City of Coos Bay Parks Department owns and operates five city parks:[12]

- Mingus Park. Located near the downtown business district, this park has a lake as its centerpiece, an arboretum on the northwest side of the lake, the city municipal pool to the north, playgrounds to the south, and a Japanese flower garden to the west. Mingus Park has a paved trail that borders the water. Aquatic birds and a fountain in the center of the lake are also attractions.
- Eastside Park**.** Located off 5th Avenue between D and E Streets, this small 0.9-acre is considered a neighborhood pocket park. The park includes a playground, open grass, picnic tables, and restroom.
- Ed Lund Park. This neighborhood pocket park is adjacent to the Fire Hall near the Newmark and the Empire business area. Many community activities are held here, such as the "Clamboree."
- Historic Hollering Place Wayside. Located at the narrowest crossing of the Coos Bay estuary, the area's original inhabitants recognized the value of this location to anyone traveling along the coast. Southbound travelers would "holler" across to the village and someone would paddle over to provide passage. Located on the deepest water in the west bay, the Hollering Place became the site of the first European settlement in what would later become Coos County.
- John Topits Park. Located in the northwestern section of Coos Bay, this 120-acre natural area encompasses the Empire Lakes and protected coastal dune and forest land. No motor boats are permitted on the lakes but canoes, kayaks and other non-motorized boats are allowed. There are 5.5 miles of pedestrian and cycling trails.

[12] http://coosbay.org/departments/parks. Accessed October 26, 2014.

Of these parks, only Mingus Park, John Topits Park, and the Historic Hollering Wayside exhibit remarkable features. Eastside and Ed Lund Parks are typical city parks, common and replaceable and do not exhibit outstanding or unusual qualities.

The Historic Hollering Place Wayside (Wayside) can be considered an 'important' recreational opportunity. The Wayside is unusual in its offerings and irreplaceable as it is the closest point to the north spit with historically the deepest water access (prior to dredging of the federal navigation channel). Water depth in this location was 23' - 26' during its historical use. It is rare because there do not appear to be additional locations that were or are used for hollering in Coos Bay. While the Wayside offers little more than a parking area and interpretive signage, which can be replaced, the location itself is rare and irreplaceable because it is on the shore of the closest point to the north spit. It can also be considered 'important' because it used during the annual 'hollering contest' as part of the Coos Bay Clamboree. For these reasons the Historic Hollering Place Wayside can be considered an 'important' recreational opportunity.

John Topits Park with its recreational lakes is remarkable within such a small city, and as a result it can be considered somewhat rare and irreplaceable. Mingus Park is located close to downtown Coos Bay and features a Japanese garden, a small lake with a walkway around it, a Frisbee golf course, and a stand of timber. While these amenities are important to neighborhood residents, the park cannot be considered unique or irreplaceable because there are other nearby opportunities to experience the same amenities. For example, nearby Winsor Park also offers Frisbee golf, one can also visit Simpson Park and Ferry Park nearby to experience stands of trees, and gardens and walkways can be readily created. For these reasons, Winsor Park is not considered 'important.'

Of the City of Coos Bay parks, only John Topits Park and the Historic Hollering Place Wayside can be considered "important" in this analysis.

2.4 PRIVATE RECREATIONAL OPPORTUNITIES

2.4.1 North Spit Overlook

The North Spit Overlook (Overlook) and nature trail is maintained by the Weyerhaeuser Company and is open to the public for nature studies, birding, walking, and photography. The overlook and trails are located on the north side of the TransPacific Parkway approximately 1 mile west of the SDPP site at an elevation of approximately 60 feet. Since construction of the Overlook, trees have grown up that obscure much of the view of the dunes to the north and west.[13]

There are many other opportunities for nature walks and other non-motorized recreational activities within the analysis area. If the North Spit Overlook did not exist, others could be constructed in similar places. The opportunity created by the North Spit Overlook for this analysis is considered common and replaceable. The Overlook will not be considered an important recreational opportunity.

[13] Information gleaned from a personal visit by Roy Hemmingway.

There are numerous private campgrounds inside and outside the analysis area in the Coos Bay area. They are common and replaceable and will not be considered as important recreational opportunities.

In summary, the important recreational opportunities within the analysis area take place at the following venues:

- Oregon Dunes National Recreation Area
- Siuslaw National Forest, Horsfall area
- Oregon Shore State Recreation Area
- Oregon Coast Bike Route
- Coos Bay Estuary
- Coos Bay Shorelands, specifically the BLM North Spit lands
- John Topits Park (City of Coos Bay)
- Historic Hollering Place Wayside (City of Coos Bay)

3.0 SIGNIFICANT POTENTIAL ADVERSE IMPACTS TO THE OPPORTUNITIES IDENTIFIED

OAR 345-021-0010(1)(t)(B). *A description of any significant potential adverse impacts to the important opportunities identified in (A) including, but not limited to:*

(i) Direct or indirect loss of a recreational opportunity as a result of facility construction or operation.

For the purpose of this Exhibit, a direct loss is assumed to occur when construction or operation of the SDPP would impact a recreational opportunity by destroying or directly altering the resource so that it no longer exists in its current state (for example, demolishing a park). An indirect loss is assumed to occur when construction or operation of the facility would limit access or otherwise alter a significant aspect of the recreational opportunity in a way that the opportunity may still exist, but that it cannot be enjoyed or used as it has been historically (for example, completely blocking a view from a scenic overlook or imposing such a nuisance impact as to render a recreational area unusable).

DIRECT LOSS

The proposed energy facility would not be located within the boundaries of any identified 'important' recreational opportunity area, as shown on Figure T-1; therefore there would be no significant direct loss of a recreational opportunity as a result of the construction or operation of the SDPP.

<u>Operation:</u> The SDPP would not cause a significant direct loss of existing recreational uses during operation because the entire facility is entirely on privately owned land (that is, none of the facility is on state owned land). This includes the barge berth which will be located above the mean low tide, elevation 0.36 feet (North American Vertical Datum of 1988 [NAVD88]), which is the concurred line of ownership for the state. Thus, during operation the barge berth will not be within state owned lands. There will be temporary construction activities (discussed *infra*) below this elevation (e.g., temporary fill, then dredging of the Access Triangle), but no permanent structures will be located below 0.36. In addition, while the Applicant anticipates that there will be a security fence surrounding the facility, there will be no restricted areas or buffer zones outside of the fenced boundaries. See Appendix T-2, Memorandum from Captain Frank Whipple regarding Restricted Areas and Buffer Zones. At this time, the Applicant is not aware of any regulation that would require a security buffer on or below state owned land. Because no security buffer is anticipated on state owned land due to operation of the SDPP, this area can continue to be used for recreational uses such as, waterfowl hunting and salmon fishing. In sum, because the SDPP is located entirely on private property and is not located on any of the identified 'important' recreational opportunities and because no security buffers beyond the applicant's private property are anticipated, the operation of the SDPP will have not cause any, significant or otherwise, direct loss of a recreational opportunity identified in Section (A).

<u>Construction:</u> Much of the above analysis also applies to construction of the SDPP. There is however one consideration surrounding the barge berth that will occur during construction; it is likely that during the estimated 36 - 39-month construction period, the state owned lands around

the barge berth will be inaccessible because temporary fill will be placed on state owned land as part of the construction process. During this time, recreational opportunities such as waterfowl hunting and fishing, will not be accessible in the Coos Bay Estuary adjacent to the barge berth, which was identified as an 'important' recreational opportunity. However, this does not qualify as a significant adverse impact because only a small area of the Coos Bay Estuary will be affected for a temporary period of 36 - 39 months or less. The total area of the temporary fill (1.0 acres) and access triangle (1.36 acres) combined is 2.36 acres and the Coos Bay Estuary totals 34,560 acres (see Section 2.1.5, the Coos Bay Estuary is 54 square miles, which is equivalent to 34,560 acres). This means that the temporary fill and access triangle are impacting less than 0.007% of the Coos Bay Estuary. Because the affected area is negligible in comparison to the entire area of the Coos Bay Estuary and it will only occur for 36 - 39 months or less, no significant adverse impacts to 'important' recreational opportunities will result from the SDPP construction.

INDIRECT LOSS

Indirect loss is assessed in relation to potential noise, traffic, and visual impacts from the facility to identified important recreational opportunities. A discussion in response to each of these potential losses is provided below. In summary, significant adverse impacts related to noise, traffic, and visual impacts to important recreational opportunities would not occur as a result of the SDPP construction or operation. Therefore, no indirect losses to those recreational opportunities are expected.

(ii) Noise resulting from facility construction or operation.

Construction: As described in Exhibit X of this Application, Oregon Administrative Rules (OAR) 340-035-0035(5)(g) exempts sounds that originate on construction sites from meeting the rules in OAR 340-035-0035(1).

Nonetheless, the Applicant acknowledges that noise associated with SDPP construction will be intermittently audible from areas near the site, depending on prevailing weather conditions (e.g., wind speed and direction or precipitation), presence of other sounds in the area, and the specific construction activities as well as their location relative to the receptor. It is anticipated that construction of the facility would last approximately 36 - 39 months. Principal noise generators during construction would be internal combustion engines on equipment moving about the site, metal-on-metal sounds from steel assembly, and steam blows. See Exhibit X, Table X-1. An estimated five or six steam blows will be conducted over a two to three week period for each power block during the construction period and will be a silenced activity. When silenced, steam blow typically results in sound levels at 50 feet away that are no greater than approximately 100 dBA.

In contrast to operational sound from SDPP, construction noise will be intermittent and variable. The anticipated work schedule for the construction phase is five 10-hour shifts, Monday through Friday, excluding holidays. To maintain the construction schedule, work shifts may be extended to two 10-hour shifts daily, six days per week, with the potential to go to a 24/7 schedule.

Recreation areas north of the site, including parts of the Oregon Dunes NRA and the Horsfall area of the Siuslaw National Forest, are located one mile away or less and may receive audible sound levels, as described in Exhibit X. However, potential sounds would be mixed with those of existing industrial uses on the North Spit, particularly the Roseburg chip facility, as well as noise from nearby off-road vehicle activity within and near Oregon Dunes NRA, and traffic on TransPacific Parkway and Horsfall Beach Road.

For context, pursuant to OAR 340-34-0030 Table 4, the ORV allowable noise limits are 78 dBA while moving at 50 feet and 95-97 dBA while stationary at 20 feet. As shown in Table X-2, the conservative (conservative because projected with all equipment running and does not take into account ground and atmospheric absorption nor does it account for shielding of terrain) estimated average construction sound levels at Horsfall area only ranges from 48 - 67 dBA. As such, for the majority of recreationists, such as beach combers and horseback riders, no significant adverse impacts resulting from construction noise of the SDPP would occur. This is because the loudest construction noise emitted from the SDPP and heard at the Horsfall area is still less than the allowable sound levels for ORVs.

However, in the most conservative terms, where audible to highly sensitive receptors using the Oregon Dunes NRA or Horsfall Area (such as birders or wildlife viewers), noise resulting from construction of the SDPP may be an intermittent annoyance. Similar potential impacts from noise could occur for hunters on the North Spit or Horsfall area where those areas are in closest proximity to the SDPP site. However, these impacts would be temporary, and the intensity would depend on the time of year construction takes place relative to hunting seasons and the presence of noise from other uses, industrial, recreational, and natural. Noise impacts to upland recreational areas during construction, if any, would be negligible and of temporary duration.

Boaters and anglers on the Coos Bay Estuary in areas close to the SDPP site may be impacted to a small degree by intermittent construction noise. Sound tends to travel over water, and therefore boaters on Coos Bay may have more opportunity to hear construction sounds than at other recreation sites, where the noise would be attenuated by topography or vegetation cover. However, again for context OAR 340-3400030 Table 4, provides that the allowable noise limits for boats atmospheric exhaust is 84 dBA while moving at 50 feet and 100 dBA while stationary at 20 inches. Due to the even louder allowable noise limits for boat atmosphere exhaust it is unlikely that construction noise from the SDPP will affect power boaters or cause a significant impact on recreational opportunities in Coos Bay Estuary. As for upland recreation areas, potential impacts from construction noise would be negligible and temporary.

Lastly, as shown in Exhibit X, noise from construction is not likely to rise above existing background sounds for users of other important recreational areas described in subsection (A), because they will be too far away from the SDPP site to detect construction noise, except during exceptional circumstances, such as very infrequent steam blows. Overall, impacts to important recreation opportunities resulting from noise during construction of the SDPP would be none to minor and be of temporary duration. No significant adverse impacts to recreational opportunities would occur as a result of construction noise.

<u>Operation</u>: As described in Exhibit X, an acoustical model of the operating SDPP facility was created. The predicted SDPP sound level contours in 5 A-weighted decibel (dBA) increments

are shown on Figure X-2. Acoustical modeling demonstrates that the SDPP will comply with applicable Department of Environmental Quality (DEQ) noise limits. Pursuant to DEQ's OAR 340-035-0035(1)(b)(A) Table 8, during operation, the SDPP will be compliant with the allowable hourly L_{50} limit of 50 dBA. Out of the aforementioned 'important' recreational opportunities the only 'noise sensitive property' (as defined in OAR 340-035-0015(38)) is the Horsfall Sand Campground (located in the Horsfall area in the Siuslaw National Forest) and operational noise levels from the SDPP were modeled to only be 47 dBA. Because the operational noise levels meet DEQ requirements it is reasonable to infer that there will not be a substantial adverse impact to the 'important' recreational areas.

Operational sounds would originate primarily from various equipment packages within the SDPP. Noise contour analysis indicates that recreational users of the Coos Bay Estuary immediately adjacent to the site, including Jordan Cove and the areas immediately east and south of the site, may be able to hear low-level sounds from the operating plant during times when background noise from the nearby US Highway 101, ORV activities in the sand dunes, the Southwest Oregon Regional Airport, and the other industrial facilities on the North Spit is not loud enough to mask it. These noise levels may exceed 55 dBA in areas close to shore near the main SDPP site. Recreational users of the Oregon Dunes NRA may perceive some low-level operational noise from the SDPP when ORV and other motorized recreational uses are not present. At Horsfall Sand Campground, the SDPP operational sound level is expected to be between 45 and 50 dBA, below the regulatory threshold set by DEQ. By way of comparison, 50 decibels is a level of sound equated with conversation in a home. Overall, therefore, operational noise from the SDPP operation would not result in significant adverse impacts to important recreational opportunities within the analysis area.

(iii) Increased traffic resulting from facility construction or operation.

A detailed description of traffic resulting from the SDPP is included in Exhibit U.

Access to the SDPP site will be from the TransPacific Parkway via Oregon Coast Highway (US 101). The TransPacific Parkway also provides access to the following 'important' recreational opportunities: the Oregon Dunes NRA, the Horsfall Area, the Oregon Shore State Recreation Area, the North Spit, and the Coos Bay Shorelands. The intersection of the TransPacific Parkway and US 101 (approximately one mile east of the site) is not currently signalized. As discussed in Exhibit U, Appendix U-2, the increase in traffic demands would have no significant impacts to traffic on US 101 as a result of construction or operations from the SDPP facility. Affected intersections along both TransPacific Parkway and US 101 are expected to meet all jurisdictional standards both during construction and operation of the SDPP facility. Therefore, no adverse impacts from traffic would be expected to 'important' recreational opportunities that are accessed from US-101.

During construction, facility-related traffic would consist of material deliveries arriving on site and construction workers. It is anticipated that construction of the SDPP would last approximately 36 - 39 months, and employ up to 500 workers maximum (across multiple shifts) during the peak of construction. Because of the number of workers required and the lack of available parking areas near the SDPP site, workers will predominantly be transported to the site by approximately 13 buses or other transit vehicle, alleviating a large influx of vehicle traffic at shift changes. Buses would arrive from the south along US 101.

As described in Exhibit U, one potential impact to traffic safety was recognized resulting from construction of SDPP at TransPacific Parkway where it intersects with US 101. Specifically, the increase in expected vehicle trips heading eastbound along TransPacific Parkway are expected to result in an increase in queue lengths approaching US 101. An increase in queue lengths corresponds to an increase in vehicle delay. As delays increase typical drivers will begin to accept smaller gaps in traffic which can result in an increase in crashes. To mitigate this potential safety concern, it is proposed that TransPacific Parkway be widened to include separate lanes for vehicles turning left (northbound) and right (southbound) onto US 101. As a result of this improvement, visitors leaving ‘important’ recreational opportunities accessed via TransPacific Parkway (i.e., the Oregon Dunes NRA, the Horsfall Area, the Oregon Shore State Recreation Area, the North Spit, and the Coos Bay Shorelands) will experience a safer, more convenient transition as they head east on TransPacific Parkway and then onto US 101. Visitors traveling to ‘important’ recreational opportunities via TransPacific Parkway would be unaffected by the lane widening as traffic flow would be maintained as it is currently. For these reasons, no adverse impacts to the ‘important’ recreational opportunities resulting from construction traffic at TransPacific Parkway are expected, and in fact, road improvements would benefit visitors as they left recreational opportunities along TransPacific Parkway.

It is plausible that water-based construction activities, such as barge delivery, could temporarily interfere with recreation opportunities in Coos Bay, such as crabbing or angling. Such impacts, if any, would be intermittent and temporary, as no more than 40 barge trips for construction of the SDPP are anticipated.

In consideration of these efforts to limit traffic, the improvements proposed at TransPacific Parkway, and the finding of no impacts to traffic along US 101, no significant impacts to ‘important’ recreational opportunities resulting from traffic during construction of the SDPP are expected.

Regular SDPP operations are expected to require about 45 full-time employees daily while the construction of the SDPP is expected to require about 500 workers daily at the peak of construction in the summer of 2018. The Traffic Impact Analysis used a conservative number of 90 operational employees. There will be 45 operational employees directly supporting the SDPP, 90 employees includes employees who may be working at the LNG terminal or gasification plant which is not directly related to operation of the SDPP. The impacts associated with construction far outweigh the impacts associated with regular plant operations (i.e. the number of operations employees are less than two-tenths of the construction employees), and because there are no mitigations required for the impacts associated with construction, there will be no mitigations nor adverse impacts to traffic on US 101 or the TransPacific Parkway during the operations phase. Other identified ‘important’ recreational opportunities, such as the Oregon Coast Bike Route and John Topits Park, are located at a great enough distance from the US 101/TransPacific Parkway intersection as to be unaffected by construction or operational traffic flows related to the SDPP. Therefore, increased traffic resulting from SDPP construction or operations will not result in significant impacts to ‘important’ recreational opportunities.

Based on the location of the other recreational areas relative to the US Highway 101/ TransPacific Parkway intersection described in subsection (A) above, no adverse traffic impacts on 'important' recreational opportunities are anticipated. Therefore, no indirect losses to important recreational opportunities as a result of traffic from SDPP construction or operations are anticipated.

In conclusion, increases in traffic as a result of facility construction would not adversely impact access to recreational opportunities in the analysis area.

(iv) Visual impacts of facility structures or plumes.

A visibility analysis was conducted to determine whether any scenic or aesthetic resources would be affected by the proposed facility. See Exhibit R of this Application for detailed discussion of impacts to identified scenic resources.

With respect to plumes, the Applicant proposes to dispose of heat from each power block using air-cooled condensers (ACCs) rather than an evaporative cooling tower. This method of cooling with ACCs does not produce a condensed water vapor plume; there will be no cooling towers or associated water vapor plumes. For a detailed discussion see Exhibit Z.

Although the SDPP will not have a cooling tower which produces the bulk of plumes which are generally associated with power plants, the SDPP's combustion turbines with Heat Recovery Steam Generators (HRSGs) will produce water vapor and under certain climatic conditions the water vapor will appear as a wispy translucent plume. Based upon plume studies performed for similar combined cycle generating facilities, condensed combustion vapor plumes will form for as many as 25% of the hours during a year, with 10% occurring during the early morning (dawn to mid-morning) with scant few occurring during the early evening (later afternoon to dusk); the remaining 15% occurring during the night.[14] That is, for the remaining 75% of hours during the year, no visible vapor plume will form. Visible vapor plumes from the proposed SDPP occasionally may be observed at dawn but will dissipate and disappear once the sun rises and wind speed increases. Such plumes would be wispy and translucent in character. The most plausible locations the plume could be visible from include the Coos Bay Estuary, the Oregon Coast Bike Route, and potentially from limited portions of the Oregon Dunes National Recreation Area, the North Spit and the Horsfall Area. Due to the limited time that plumes would occur (only 25% of the hours during a year, with 10% occurring during early morning visible hours) and with the wispy translucent nature of the plume, the plumes would not significantly impact 'important' recreational opportunities. For more detail see Exhibit L and R.

With respect to structures, construction of the SDPP would be visible to recreational users from the waters of Coos Bay, limited portions of the Coos Bay Shorelands Special Recreation Management Area (SRMA), the McCullough Bridge/Highway 101, and northern areas of North Bend, including portions of the Oregon Coast Bike Route. Construction activities would also be noticeable to motorists using the TransPacific Parkway on their way to recreational activities on the North Spit and in the Horsfall area. Visual effects from construction activities would include dust and views of construction equipment on the site. These effects would be limited to the

[14] Theodore Main, Principal Meteorologist and Condensed Combustion Plume Specialist, TRC Environmental Corporation.

anticipated 36 - 39 month construction period and are not expected to result in substantial adverse visual impacts to 'important' recreational opportunities.

As described in Exhibit R, the most prominent visible features of the operating SDPP would be the 165-foot-high (above sea level) exhaust stacks, due to their height. When viewed from the south, (i.e., Coos Bay Estuary) the exhaust stacks would present a visual contrast relative to the dunes, forest, and adjacent natural landscape to the north, but would be located on a previously used industrial site in an industrial area and adjacent to an existing industrial facility, the Roseburg chip facility.

Other structures visible on the SDPP site include transmission towers (up 163 feet in elevation), the air-cooled condensers (121 feet above sea level), and control, administration, and warehouse buildings (between 20 and 30 feet above grade, or up to 76 feet above sea level).

As detailed in Exhibit R, portions of the SDPP would be visible, in whole or in part, to recreational users on Coos Bay, from very limited southern portions of the Oregon Dunes NRA and from limited portions of the Coos Bay Shorelands SRMA, including the BLM boat launch. Though the zone of visual influence (ZVI) analysis conducted for Exhibit R indicates that portions of SDPP would be seen from John Topits Park, the park is forested, and so views of any part of SDPP are highly unlikely. The ZVI analysis also indicates that portions of the SDPP may be seen from the Historic Hollering Place Wayside, however the Wayside faces primarily west northwest, and the SDPP is oriented northeast of the Wayside, thus because it will not be in the line of site, views of the SDPP will not be a part of the experience at the Wayside. As noted below any views from the Wayside of the SDPP are likely to blend into the surrounding industrial area on the North Spit. The facility would be noticeable for short periods of time to cyclists and sightseeing motorists using Highway 101, but would be seen from over a mile away and viewed in the context of neighboring industrial uses, and therefore not in contrast relative to the landscape setting.

Overall, visual impacts on recreational users in areas with views of the SDPP would vary by receptor, but are anticipated to be negligible to minor, depending on the sensitivity of the user and their recreation objective. For example, hunters on the North Spit may be less sensitive to visual contrasts resulting from limited views of exhaust stacks of the SDPP facility than would visitors to the area on a scenic hike in the Oregon Dunes NRA. Overall, the SDPP will be visually consistent with other industrial elements present in the North Spit viewshed--that is, it would not introduce a previously unseen development pattern in the analysis area. Furthermore, important recreational areas with identified scenic quality and also having expansive views of the SDPP are few and located at sufficient distance that the SDPP would be visually absorbed by the surrounding landscape. That is, views of the SDPP would not block or otherwise visually dominate existing scenic vistas seen from recreational areas. As such, even though the SDPP may be partially visible from identified important recreational facilities, it is demonstrated that it would not result in significant visual impacts to the overall recreational quality of those facilities.

Based on the findings above, no significant indirect losses are anticipated to important recreational opportunities as a result of noise, traffic, or visual impacts from the proposed SDPP construction or operations. Consequently, no significant adverse impacts to important recreation opportunities are anticipated.

4.0 MITIGATION MEASURES

OAR 345-021-0010(1)(t)(C). *A description of any measures the applicant proposes to avoid, reduce or otherwise mitigate the significant adverse impacts identified in (B).*

The proposed energy facility is not anticipated to have significant adverse impacts on recreational opportunities and facilities in the analysis area. However, the Applicant has proposed several measures to reduce potential traffic, and visual impacts on recreational opportunities during SDPP construction and operation.

The Applicant will work with the Oregon Department of Transportation and Coos County Road Department to widen TransPacific Parkway at US Highway 101, in order to reduce congestion impacts during construction. The applicant is working to reduce worker trips to the site through private mass transit. Construction-related traffic congestion will also be mitigated by bringing the largest components of the SDPP into the site through the barge berth and haul road.

The Applicant has proposed several measures to reduce visual impacts. The main equipment and buildings will be painted neutral colors to blend with the background. Equipment arrangements and locations were evaluated to minimize visual effects, with the conclusion that the proposed size, profile, and location would be the optimum considering other environmental factors, safety, operation, and reliability. Native plants will be used for final site restoration, stabilization, and landscaping. Only lighting required for operation and maintenance, site safety and security, and to meet potential FAA requirements would be used at the facility. Lighting would be localized to minimize off-site effects. See Appendix R-7 for the Applicant's lighting methods (detailing measures to minimize light pollution) and the Applicant's proposed lighting plan.

5.0 MAP OF ANALYSIS AREA

OAR 345-021-0010(1)(t)(D). *A map of the analysis area showing the locations of important recreational opportunities identified in (A).*

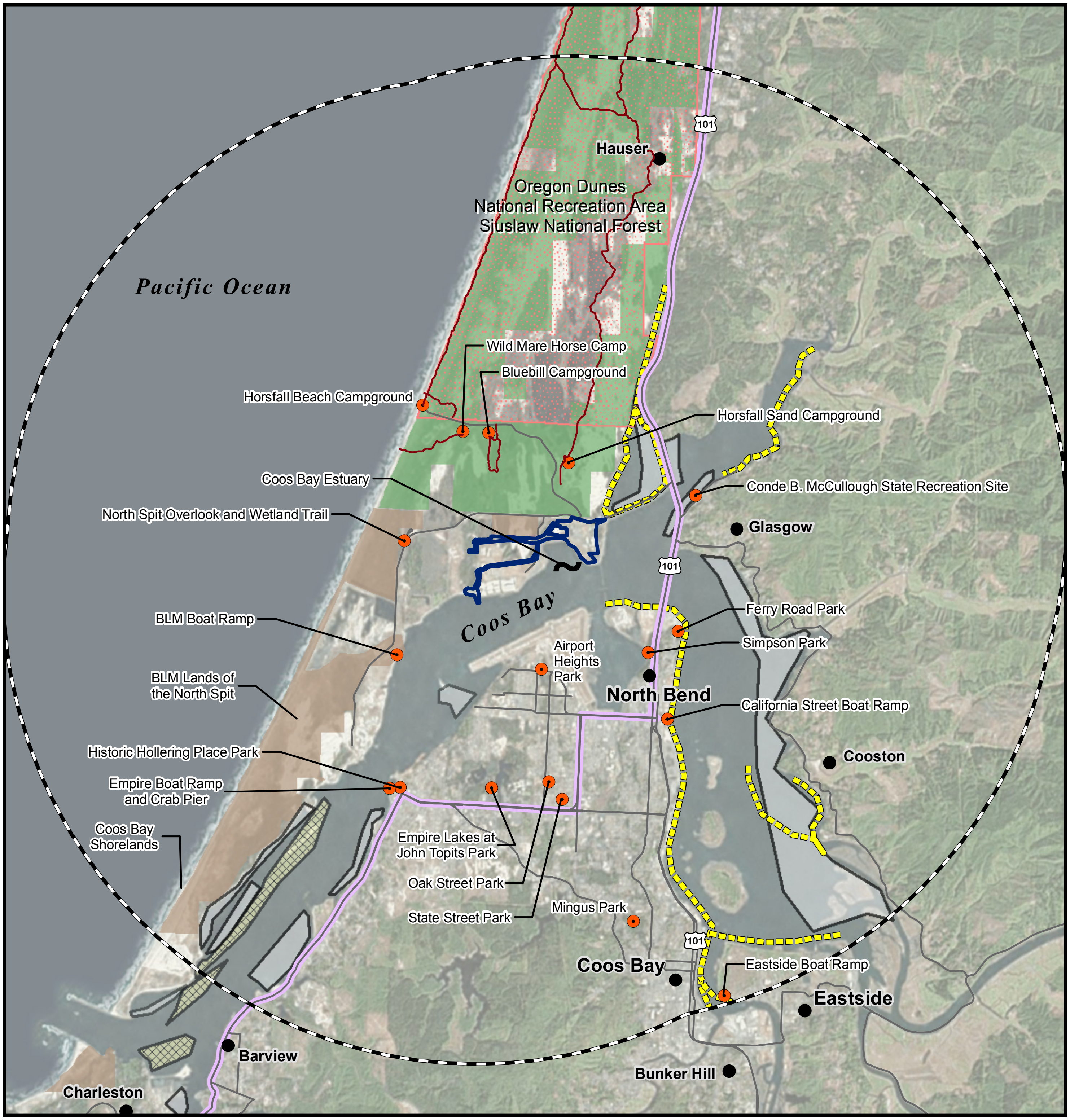
Figure T-1 shows important recreational opportunities and facilities in the 5-mile radius analysis area.

6.0 MONITORING PROGRAM

OAR 345-021-0010(1)(t)(E). *The applicant's proposed monitoring program, if any, for impacts to important recreational opportunities.*

Construction and operation of the SDPP is not anticipated to have any significant or adverse impacts on the recreational opportunities and facilities in the analysis area. No monitoring programs are proposed beyond those required for other activities, such as stormwater runoff, noise, and air contamination.

Figure T-1. Important Recreational Opportunities in the Analysis Area



0 0.75 1.5 Miles

1 inch = 1.5 miles

N

Data Sources: BLM, www.dfw.state.or.us/MRP/shellfish/maps/Coos.asp, coostrails.com, USFS, SHN Consulting Engineers & Geologists, Inc., DEA

- EFSC Site Boundary
- Analysis Area (5 mile buffer from EFSC Site Boundary)
- Clamming Area
- Crabbing Area
- Water Trail
- USFS Trail
- Recreation Opportunity
- Oregon Coast Bike Route
- Coos Bay Shorelands Special Recreation Management Area
- Siuslaw National Forest
- Oregon Dunes NRA

South Dunes Power Plant Project

EFSC Application

EXHIBIT T

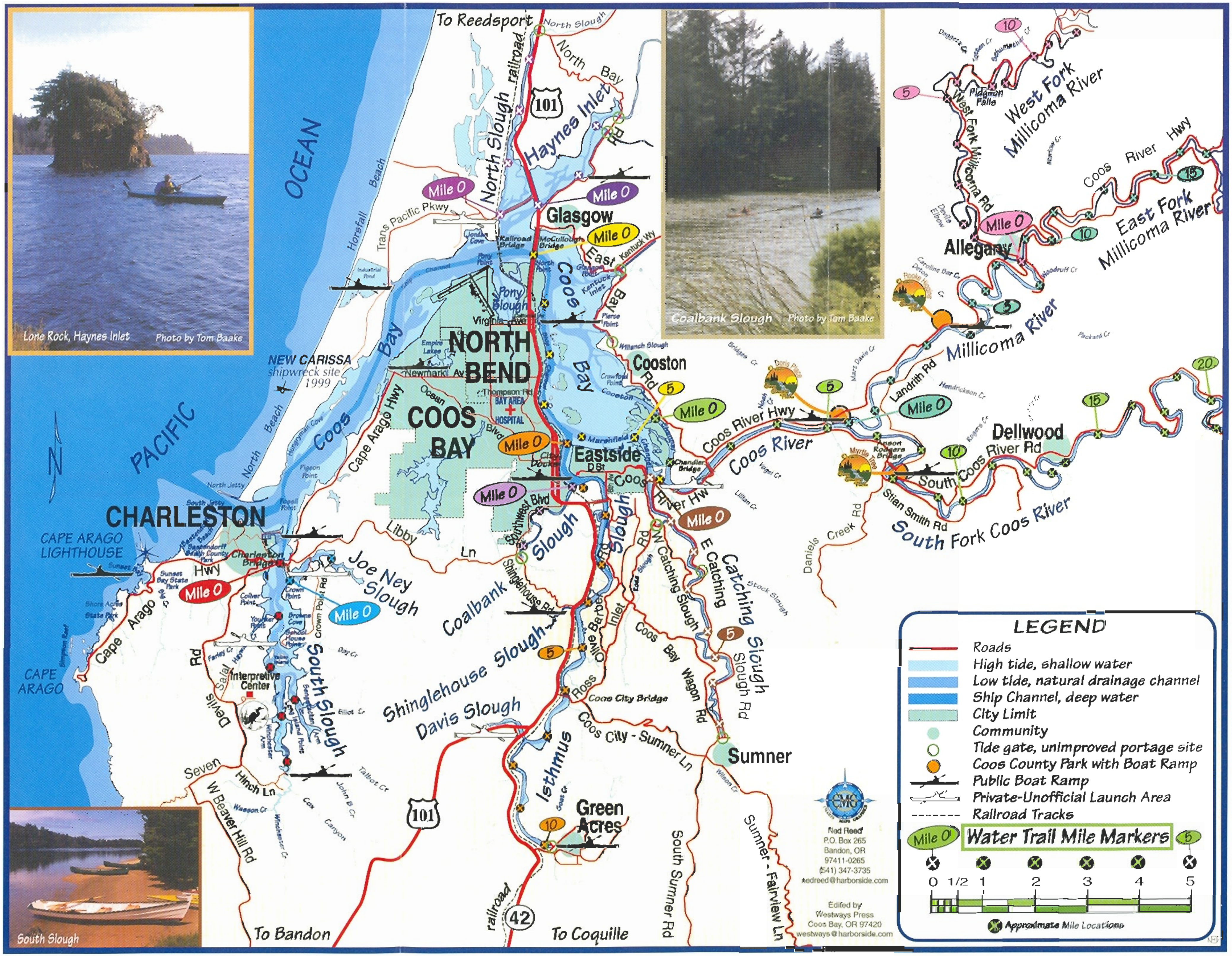
Figure T-1

Important Recreational Opportunities within the Analysis Area

Date: 9/23/2014
Reviewed By BR
Designed By SAST

APPENDIX T-1

Water Trails and Recreational Shellfish Areas in Coos Bay


Lone Rock, Haynes Inlet
Photo by Tom Baake
Coalbank Slough
Photo by Tom Baake
South Slough
To Reedsport
North Slough
North Bay
Haynes Inlet
101
railroad
PACIFIC
OCEAN
Horsfall Beach
North Beach
Trans Pacific Pkwy
Glasgow
Mile 0
McCullough Bridge
Railroad Bridge
East Bay
Kentucky Wy
Kentucky Inlet
Pony Slough
Coos Bay
NEW CARISSA
shipwreck site
1999
NORTH BEND
Virginia Ave
Newmark Av
COOS BAY
Ocean Blvd
Cape Arago Hwy
BAY AREA HOSPITAL
Thompson Rd
Cooston
Cooston Rd
Eastside
D St
Marshfield Channel
Chandler Bridge
Coos River Hwy
Coos River
Millicoma River
West Fork Millicoma River
East Fork Millicoma River
Coos River Hwy
Allegany
Pidgeon Falls
West Fork Millicoma Rd
Landrith Rd
Dellwood
South Coos River Rd
South Fork Coos River
Stian Smith Rd
Anson Rogers Bridge
Daniels Creek Rd
CHARLESTON
Charleston Bridge
CAPE ARAGO LIGHTHOUSE
CAPE ARAGO
Cape Arago Hwy
Libby Ln
Joe Ney Slough
Crown Point Rd
Coalbank Slough
Southwest Blvd
Shinglehouse Rd
Shinglehouse Slough
Davis Slough
South Slough
Interpretive Center
Seven Devils Rd
Hinch Ln
W Beaver Hill Rd
Isthmus Slough
Olive Barber Rd
Coos Bay Wagon Rd
Coos City Bridge
Ross
Coos City - Sumner Ln
W Catching Slough
E Catching Slough
Catching Slough
Catching Slough Rd
Sumner
Green Acres
To Bandon
To Coquille
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LEGEND
Roads
High tide, shallow water
Low tide, natural drainage channel
Ship Channel, deep water
City Limit
Community
Tide gate, unimproved portage site
Coos County Park with Boat Ramp
Public Boat Ramp
Private-Unofficial Launch Area
Railroad Tracks
Water Trail Mile Markers
0 1/2 1 2 3 4 5
Approximate Mile Locations

1 Haynes Inlet, North Slough, Pony Slough

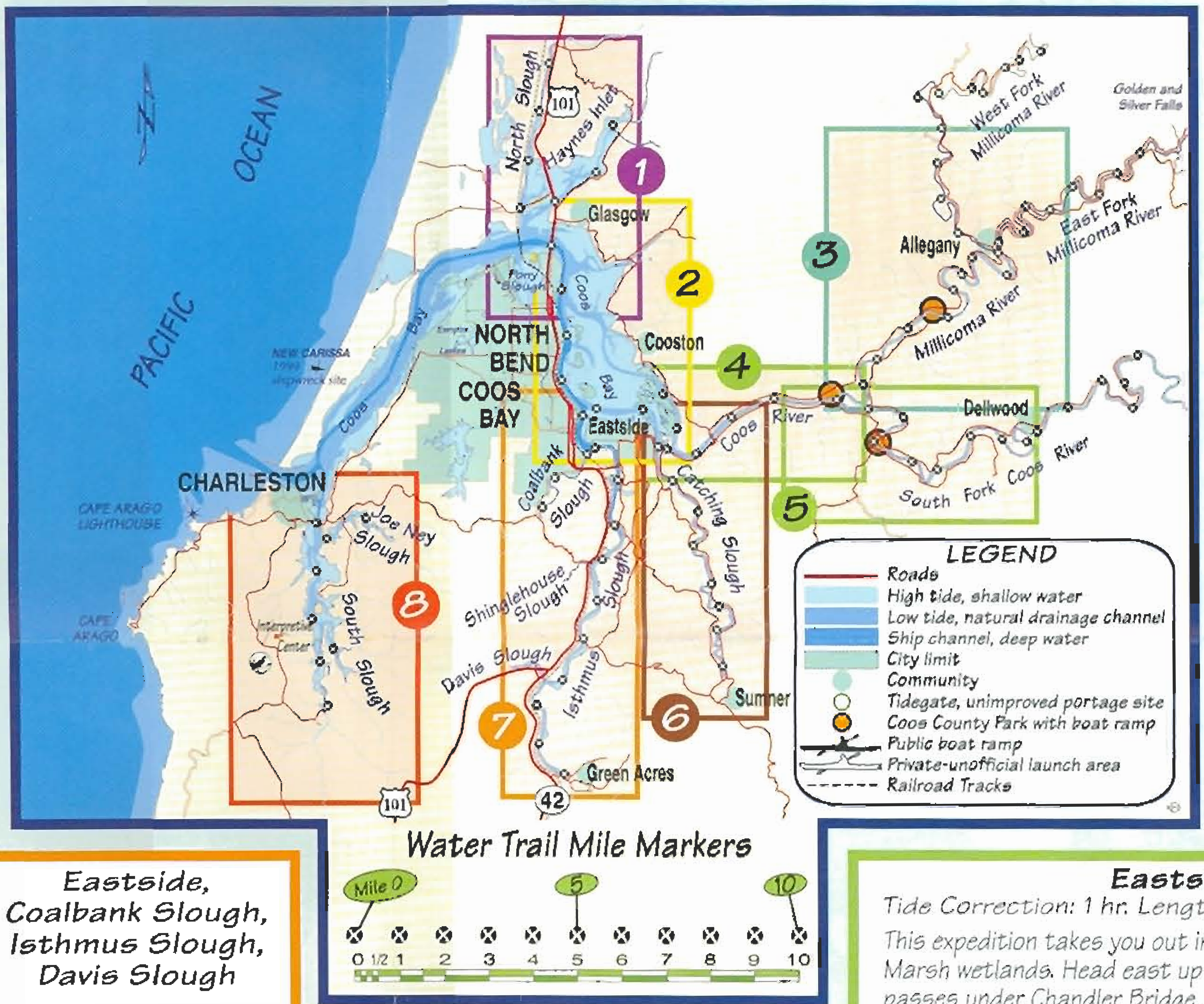
Tide correction: 1 hr.
Length: Haynes Inlet, 8 mi. around perimeter.
North Slough, 7.1 mi roundtrip

Launch on incoming tide from boat ramp along North Bay Rd. or from sandy beach at west end of North Spit Causeway. These inlets of the estuary are home to waterfowl and birds. Lone Rock is a highlight of Haynes Inlet.

2 Coos Bay RR Bridge, city waterfronts, bay islands, Eastside

Tide correction: 1 hr. 10 min.
Length: North Bend to Eastside: 6 mi. roundtrip

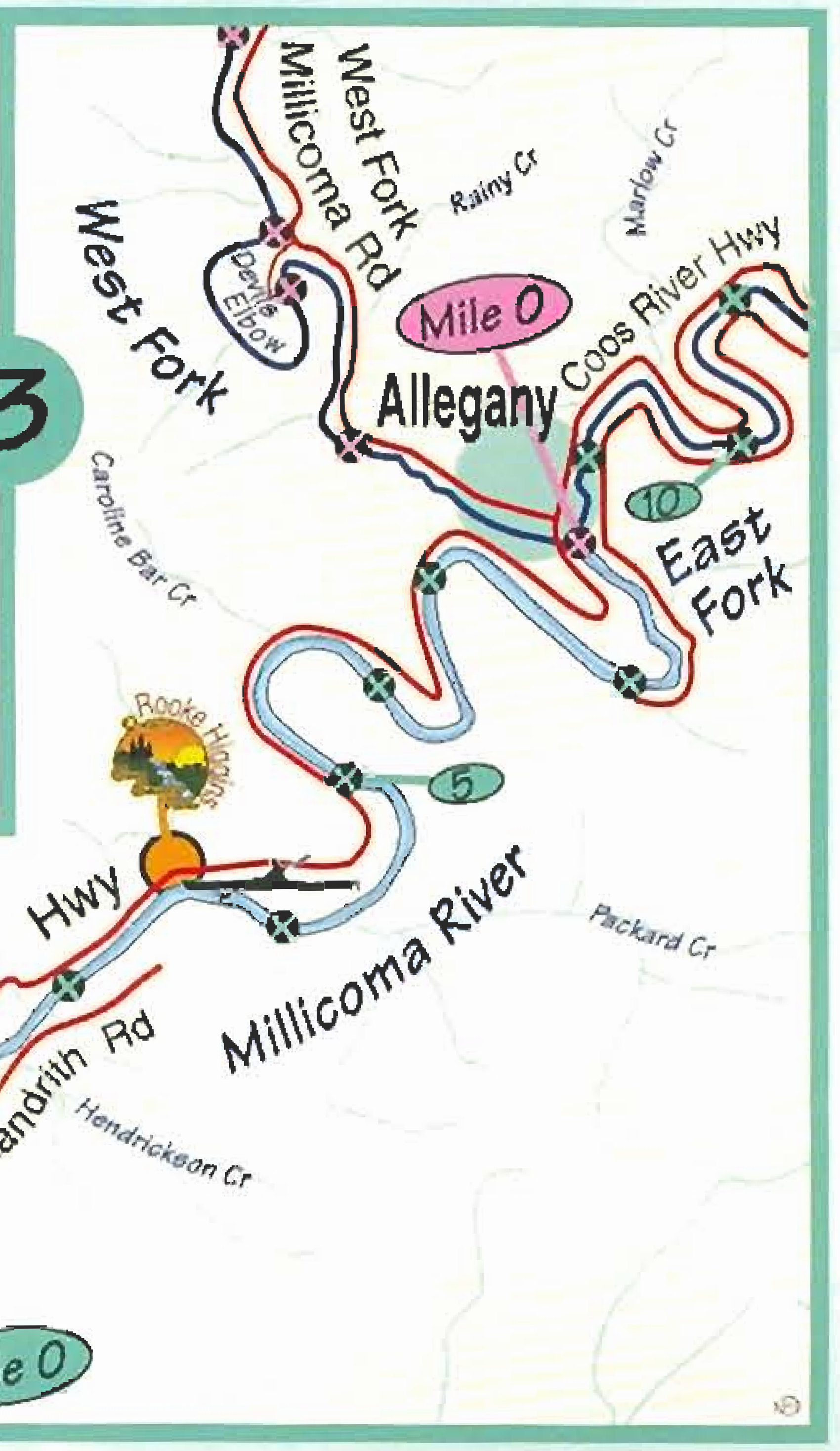
Launch expeditions from California Ave. Boat Ramp in North Bend. Head down the channel, passing under McCullough Bridge and the railroad bridge, and into Pony Slough. Head up the channel to view bay islands and city waterfronts. Coos Bay offers docks at the Boardwalk and a boat ramp in Eastside.

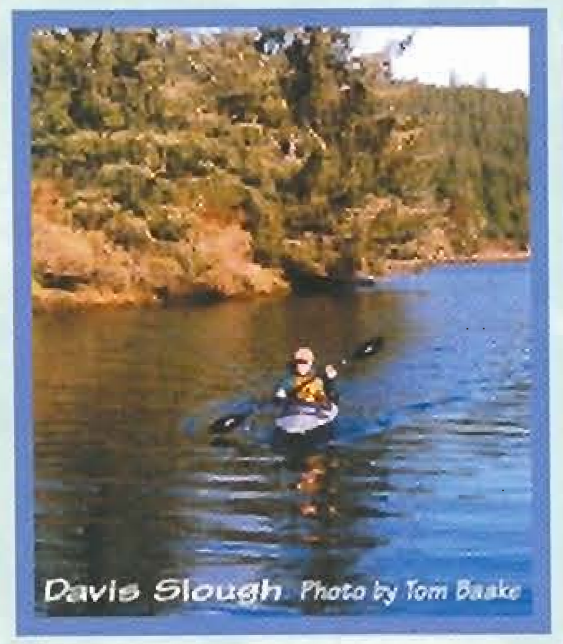


3 Millicoma River, Allegany

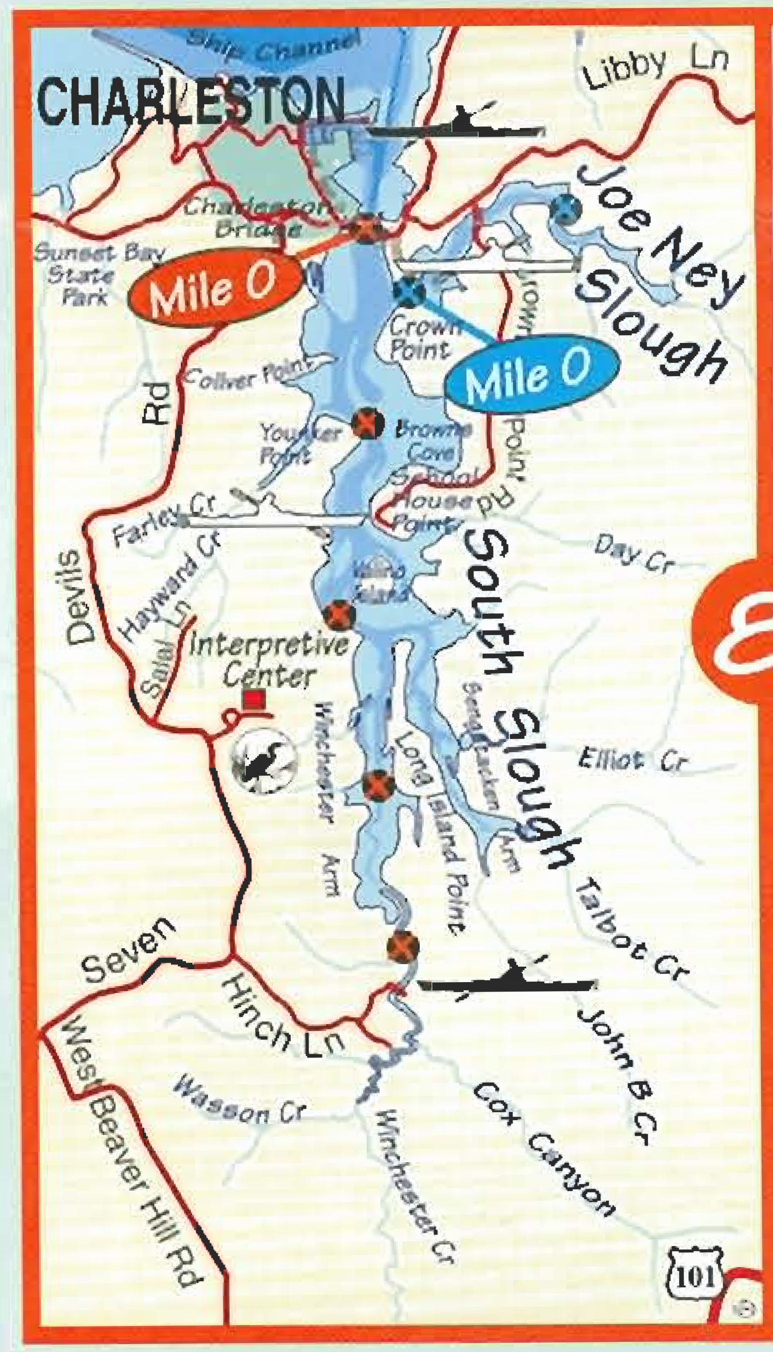
Tide correction: 2 hrs.
Length: Doris Place Boat Ramp one way to Allegany: 8.3 mi.

Launch from Doris Place Boat Ramp, use the tidal current up Millicoma River. Available stop at Rooke-Higgins Boat Ramp. Allegany is head of tidewater.





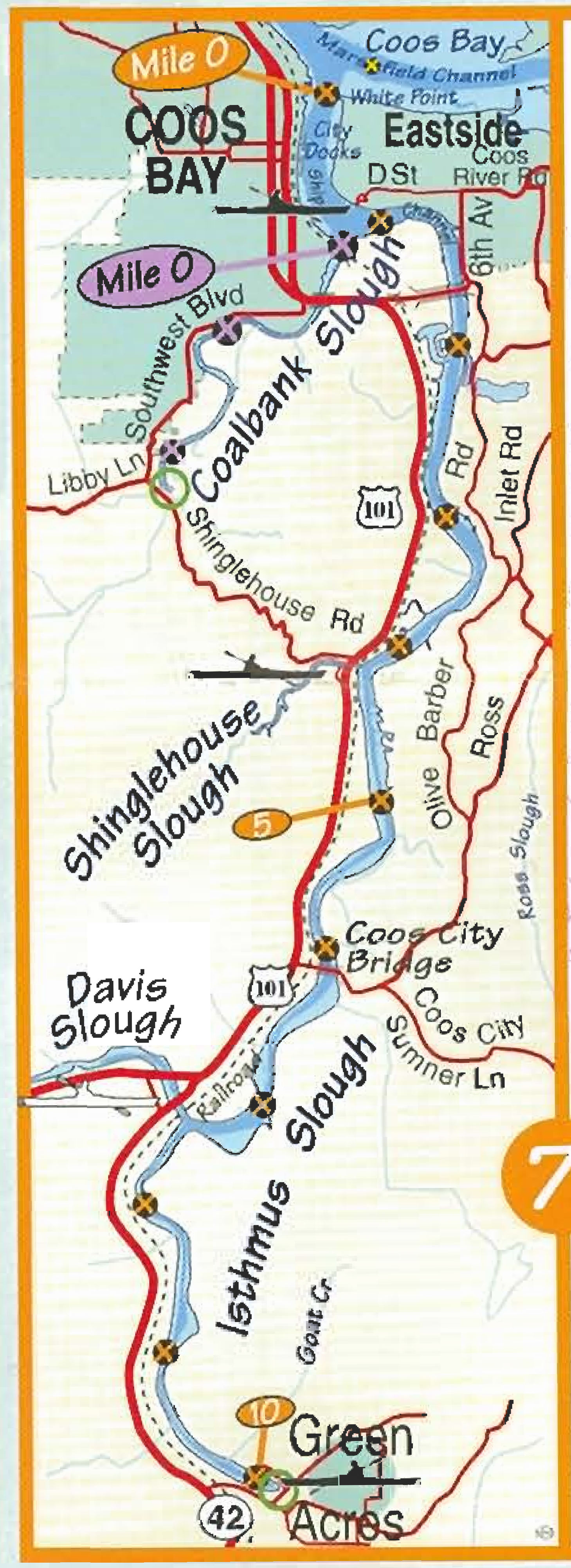
Davis Slough Photo by Tom Baake



8 Charleston, Joe Ney Slough, South Slough

Tide correction: Charleston (none)
Hinch Lane put-in: 45 min.
Length: Charleston Bridge to Hinch Lane: 4.5 mi.
Charleston to Joe Ney Slough: 3.2 mi. round trip

Much of this paddle is within South Slough National Estuarine Research Reserve. Plan trips when incoming tides provide adequate water. Consider a vehicle shuttle, leaving one in Charleston and one at Hinch Lane put-in. Joe Ney Slough: From Troller Rd. put-in, paddle south around Charleston Boat Yard, then head east.



7 Eastside, Coalbank Slough, Isthmus Slough, Davis Slough

Tide correction: Eastside Boat Ramp: 1 hr.
Shinglehouse Slough Boat Ramp: 2 hrs.
Greenacres Boat Ramp: 3+ hrs.
Length: 5 to 10 mi. roundtrip.

Several paddles can be launched from Eastside. Plan trips on incoming tide. Coalbank Slough: paddle across the channel into Coalbank Slough, passing under railroad bridge and US 101 overpass. Inlet wends through wetlands, ends at a tidegate.

Isthmus Slough: follow main channel east, then south, going under Isthmus Slough Bridge. There are remnants of old docks, train trestles, even a ferry. In 3.1 miles is Shinglehouse Slough, a 2-mile roundtrip. At 6.3 miles is Davis Slough, a 2.8-mile detour. The main channel ends at Green Acres Boat Ramp.

6 Catching Slough

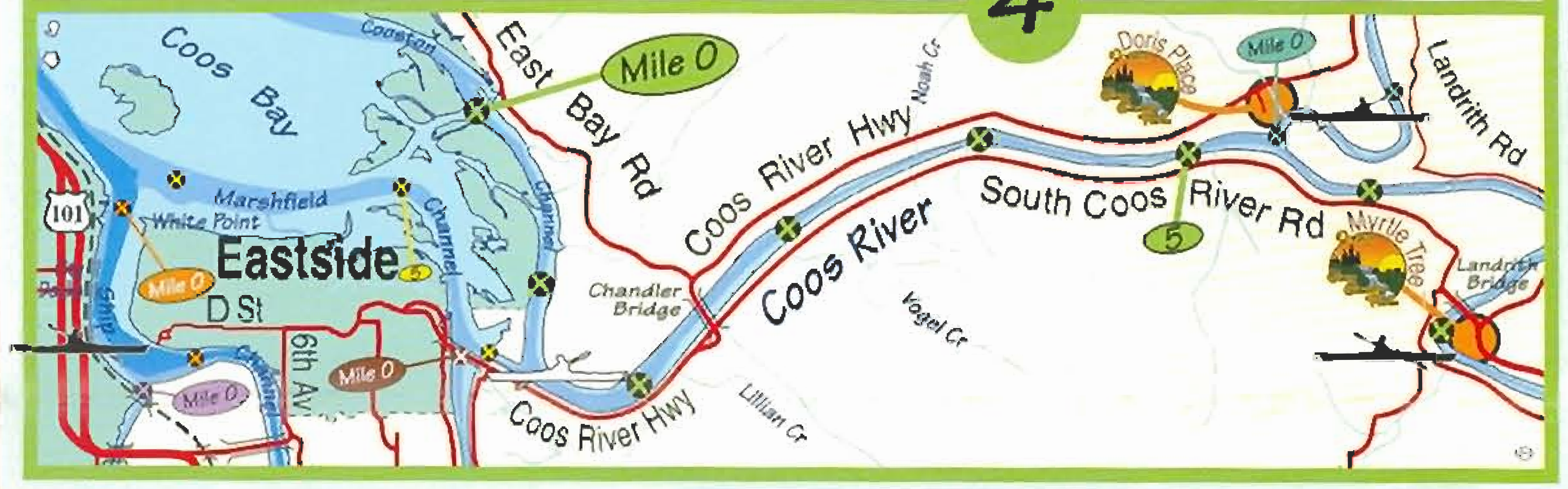
Tide correction: 2 hrs.
Length: 8+ miles roundtrip

Launch on incoming tide from boat ramp at southeast end of Catching Slough Bridge. This waterway served as a major thoroughfare of the Coos Bay area, with boats taking travelers and goods to the Coos Bay Wagon Road, the overland passage to Roseburg. The inlet meanders through farmland and wooded areas, and supports waterfowl and abundant birdlife.

4 Eastside, Coos River, Millicoma River

Tide Correction: 1 hr. Length: Eastside to Doris Place Boat Ramp: 7.8 mi.

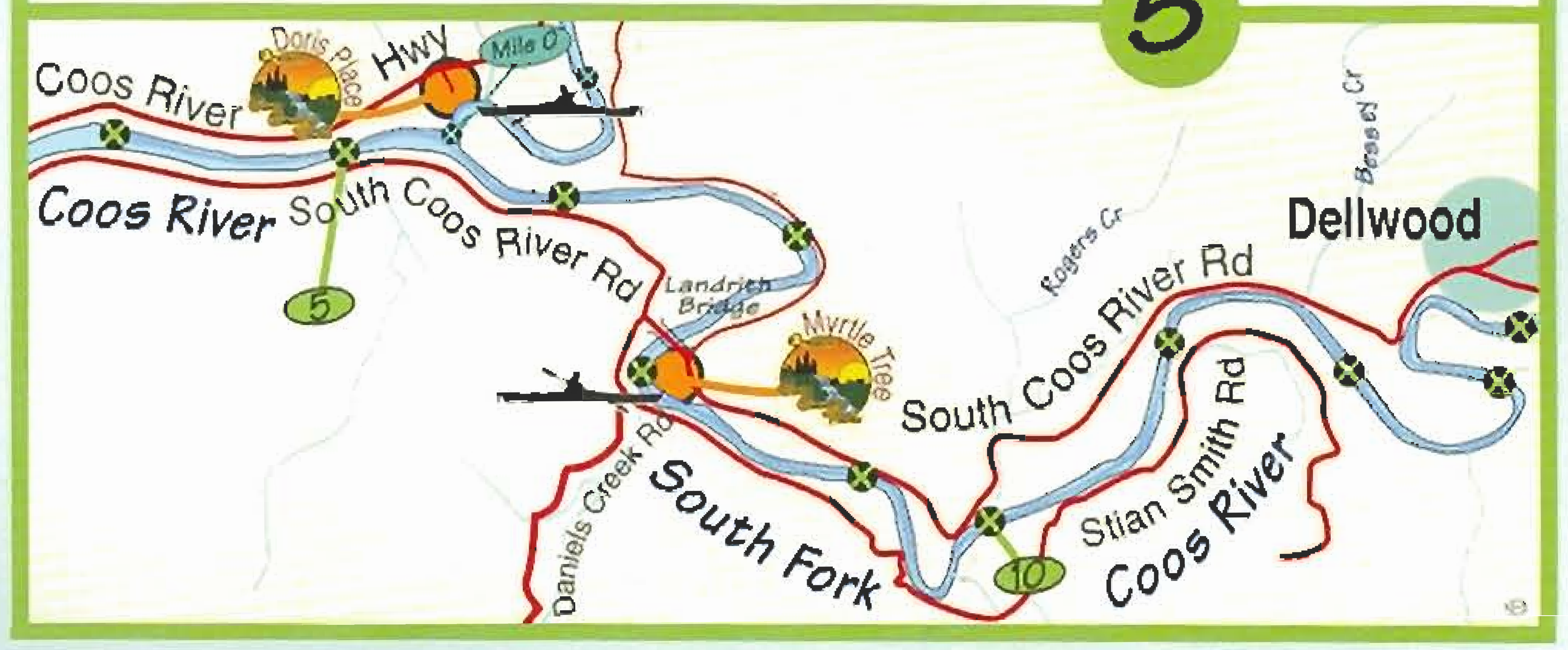
This expedition takes you out into the Coos Bay channel and around White Point, passing Millicoma Marsh wetlands. Head east up Coos River, passing shipyards and Catching Slough. The channel passes under Chandler Bridge. At the forks of Coos and Millicoma Rivers, head northeast to Doris Place Boat Ramp.



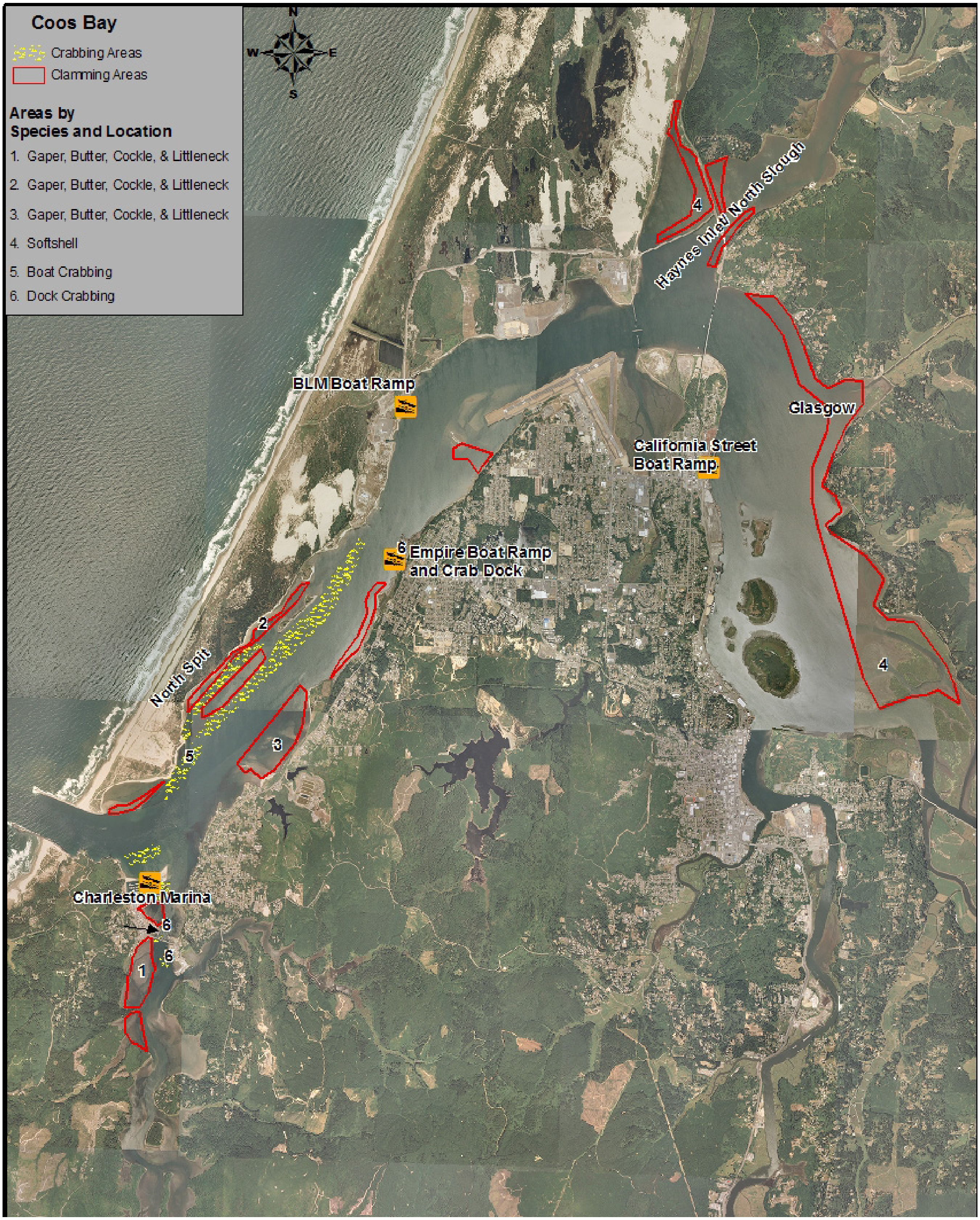
5 South Fork Coos River, Dellwood

Tide correction: 2 hrs. Length: Myrtle Tree Boat Ramp to Dellwood: 8.1 mi.

From Myrtle Tree Boat Ramp on South Fork Coos River, follow the river up to head of tidewater near Dellwood. The route twists and turns by farms and ranches, with the river lined with old maples, cedars, spruce, and fir.



Coos Bay Shellfish Areas



APPENDIX T-2

Appendix T-2 Memorandum from Frank Whipple Regarding Restricted Areas

Memorandum

Date: 16 October 2014

From: Frank Whipple

To: Meagan Masten

Subj: SDPP Restricted Areas and Buffer Zones

Per our discussion, please find the paragraphs detailing the security measures for the SDPP.

The entire South Dunes Power Plant (SDPP) has been incorporated into the Marine Transportation Security Act (MTSA) security requirements. These requirements are found in 33 Code of Federal Regulations (CFR) 101-105. Under these regulations, the facility must develop a Facility Security Plan which is submitted to the US Coast Guard for review and approval.

The regulatory requirements provide for the establishment of a Secure Area within the boundaries of the facility. The boundaries for security will be marked by a security fence around the entire plant. Only authorized personnel are allowed inside the fenced area. Access control measures are established and approved by the US Coast Guard.

At the barge dock (during construction), the area within a specific area surrounding the dock will require a Facility Security Plan. This plan will comply with the same requirements in 33 CFR 101-105. These regulations apply to when the barge dock will be used to unload a vessel subject to the International Convention for Safety of Life, that receives foreign cargo vessels greater than 100 gross register tons, or when it receives U.S. cargo vessels, greater than 100 gross register tons. The area will be fenced and only authorized personnel will be allowed entry. Any vessel using the dock during these times will also be required to have and maintain a Ship or Vessel Security Plan.

All of the above security plans require specific actions within the fenced boundaries. Jordan Cove must monitor the boundaries to ensure unauthorized access does not occur. The areas beyond the fenced boundaries may be private property owned by Jordan Cove or others and subject to existing State and County regulations regarding trespassing.

There are no restricted areas or buffer zones outside of the fenced boundaries.

For clarification, the Facility Security Plan for the SDPP will come into effect at the end of construction. The barge dock is a temporary dock used during construction and will have a separate plan to be used only when a vessel is unloading and cargo remains at the dock. When the vessel and cargo are not present, no security plan will be in place.

Sincerely,

Frank Whipple

3553 N. Atlantic Avenue, Suite A-158, Long Beach, CA 90807 714 892-0085

Company Background: Amergent Techs brings years of U. S. Coast Guard, law enforcement, US Customs, Special Forces and private industry experience to the tasks as hand. Amergent Techs is a qualified service disabled, veteran owned small business established over 9 years ago with literally hundreds of years of combined experience supporting response planning, risk management, incident response programs, maritime surveillance, hazardous materials response, maritime operations, port operations, and military operations. The AT team has world-wide experience working in the maritime and port domains with unparalleled expertise in the Pacific Rim. AT has access to resources and expertise to support special projects.

Amergent Techs provides specific expertise for ports and terminals supporting many customers and stakeholders in the area with maritime security and safety risk assessments, coordinating the efforts to minimize risk and developing solutions to complex problems. Its personnel serve in the transportation industry as senior management advisors, waterway management specialists, regulatory support services, cargo security experts, Facility Security Officers, fleet operations managers, and security specialist for new Liquefied Natural Gas (LNG) facilities.

Captain Whipple has many year's commercial experience in marine safety and port security and 28-years of experience with the U.S. Coast Guard. He was formerly head of the U.S. Coast Guard's Pacific Region headquarters, Marine Safety, Security and Environmental Response Division and served as Captain of the Port, Alternate Captain of the Port and Commanding Officer of Port Security Unit 302 and the Atlantic Strike Team.

3553 N. Atlantic Avenue, Suite A-158, Long Beach, CA 90807   714 892-0085

EXHIBIT U
PUBLIC SERVICES
OAR 345-021-0010(1)(U)

CONTENTS

TABLES

FIGURE

APPENDICES

Appendix U-7. An Economic Impact Analysis of the Construction of an LNG Terminal and Natural Gas Pipeline in Oregon

1.0 INTRODUCTION

This exhibit provides information about significant potential adverse impacts of construction and operation of the proposed facility on the ability of public and private providers in the analysis area to provide the services listed in Oregon Administrative Rule (OAR) 345-022-0110, and evidence to support a finding that construction and operation are not likely to result in significant adverse impacts. The proposed project is the 420 megawatt (MW) natural gas-fired South Dunes Power Plant (SDPP) to be located on the North Spit in Coos Bay, in Coos County, Oregon. Communities located within the 10-mile boundary of the analysis area are provided in Table U-1.

Table U-1. Public Services Analysis Area Communities[1]

<table>
<tr><th>Communities
Within 5 Miles</th><th>Population</th><th>Communities
Within 10 Miles</th><th>Population</th></tr>
<tr><td>Coos Bay, OR</td><td>16,160</td><td>Lakeside, OR</td><td>1,705</td></tr>
<tr><td>North Bend, OR</td><td>9,720</td><td rowspan="3">Hauser, OR*
(unincorporated)</td><td rowspan="3"></td></tr>
<tr><td>Bunker Hill, OR*
(unincorporated)</td><td rowspan="5">Within the Coos County total</td></tr>
<tr><td>Cooston, OR*
(unincorporated)</td></tr>
<tr><td>Shorewood, OR*
(unincorporated)</td><td rowspan="3">Coos County
(only portions of these communities and Coos County are within 10 miles)</td><td rowspan="3">62,860</td></tr>
<tr><td>Empire, OR*
(unincorporated)</td></tr>
<tr><td>Barview, OR*
(unincorporated)</td></tr>
</table>

[1]Source: Center for Population Research, July, 2013. The populations for communities shown with an "*" are included within the Coos County total.

As described below, the proposed construction of the SDPP would have minimal adverse impacts on public and private services and in many instances will greatly benefit public services. Examples of benefits include an economic benefit from property taxes and workers spending in the community, schools receiving funds for each student, and the Southwest Oregon Regional

Airport receives user fees when planes land.[1] This analysis has evaluated impacts on public and private services, and balanced mitigation measures have been proposed where there is a potential for significant adverse impacts.

[1] Airport user fees range from $10 - $645. http://www.flyoth.com/airport_information.php. See also, Appendices U-5 and U-7.

2.0 IMPORTANT ASSUMPTIONS USED TO EVALUATE POTENTIAL IMPACTS

OAR 345-021-0010(1)(u)(A). *The important assumptions the applicant used to evaluate potential impacts.*

To assess the impact of new development on public services, it is necessary to establish the level of service currently provided to communities and to project how the level of service would change as a result of the natural background population growth, in addition to the proposed facility under evaluation. One way to establish the level of service is to compare the current operating service levels to a set of public service standards. Regional or local standards for public services are not available for the analysis area, which is a 10-mile radius of the project location. Therefore, service system capacities (including sewers and sewage treatment, water supply, stormwater drainage, solid waste management, housing, traffic safety, police and fire protection, health care and schools) are described and estimated.

While an influx of approximately 500 personnel is expected during construction activities, it is assumed that of the itinerant workers, few will move their families to Coos County due to the fact that construction workers will only work for the time necessary to complete their construction task.[2] Of the 500 anticipated construction workers, it is estimated that approximately half will be local, i.e. living within North Bend or within commuting range of North Bend. ECONorthwest's analysis found that in 2011 there were 3,710 underemployed trained construction workers within commuting distance of North Bend. However, not all available workers in the local area are experienced in heavy construction. The estimated number of local, available construction workers experienced in heavy construction is 1,076.[3] Given past experience with construction of other power plants by the Applicant's contractor Black and Veatch, the availability of local experienced construction workers, the Applicant assumed that approximately half the construction workforce, 200-300 workers, will be within commuting distance of North Bend.

Following facility construction, it has been estimated that the SDPP will require a total of approximately 45 full-time workers during facility operation. It is assumed that if availability of public and private services were sufficient for 500 construction workers, that services would also be adequate for 45 operational employees. It should be noted that the traffic impact analysis, Appendix U-4, went beyond the 45 operational employees directly supporting the SDPP and included an analysis of 90 operational employees. The additional 45 employees represent employees supporting other nearby industrial facilities such as the gasification and LNG terminal which are not directly related to operation of the SDPP.

Given the well-established public and private providers for the aforementioned systems and the minimal public services the proposed facility would require during construction and operation, as detailed throughout Exhibit U, it was assumed that the facility would not adversely impact a

[2] Appendix U-5, page 1.
[3] Appendix U-5, page 7, Table 1.

particular service system if the system were currently operating below capacity.[4] Moreover, if a system was reported to be operating at capacity and the public service provider had plans for system expansion in the future, it was assumed that the proposed facility would not adversely impact the planned system capacity. For example, the Coos Bay School District has plans for new building configurations that may include additional school buildings if needed (Coos Bay School District, 2014, Appendix U-3).

[4] This principal is generally applied throughout the exhibit and is specifically applied by ECONorthwest 2012, Appendix U-5, pages 26 and 30 regarding the capacity for schools to accommodate additional students.

3.0 PUBLIC AND PRIVATE PROVIDERS IN THE ANALYSIS AREA AND LIKELY IMPACTS

OAR 345-021-0010(1)(u)(B). *Identification of the public and private providers in the analysis area that would likely be affected.*

OAR 345-021-0010(1)(u)(C). *A description of any likely adverse impacts to the ability of the providers identified in (B) to provide the services listed in OAR 345-022-0110.*

Table U-2 identifies the public service and utility providers for the communities in the analysis area that provide the essential governmental services listed in OAR 345-022-0110. The following is a description of the public service providers within the communities in the analysis area.

In addition to the community services listed in Table U-2, the project site has three other service providers.

- Water is provided by the Coos Bay North Bend Water Board (CBNBWB);
- Wastewater is managed onsite and through the introduction of water into the industrial wastewater pipeline that runs from the Project site, through the Oregon International Port of Coos Bay's (the "Port") property, and to the Port's ocean outfall facility. The water is then discharged from the Port's ocean outfall facility; and
- A public-use airport (Southwestern Oregon Regional Airport) is operated by the Coos County Airport District.

Table U-2. Service Providers for the Analysis Area

Service	City of Coos Bay, OR	City of North Bend, OR	Coos County, OR
Sewage Collection and Treatment	Coos Bay Public Works and Development Department[1]	North Bend Public Works Department[2]	None
Water Supply			None
Storm Water Drainage			None
Solid Waste	Contracted services through Coos Bay[1]	Contracted services through North Bend[2]	None (Contracted services with Dry Creek Landfill)
Police	Coos Bay Police Department[3]	North Bend Police Department[4]	Coos County Sheriff's Office[5]
Emergency Services & Fire	Coos Bay Fire Rescue[6]	North Bend Fire Department[7]	
Health Care	Bay Area Hospital[8]	North Bend Medical Center[9]	None

Table U-2. Service Providers for the Analysis Area

Service	City of Coos Bay, OR	City of North Bend, OR	Coos County, OR
Education	Coos Bay School District[10]	North Bend School District[11]	None
Air Transport	None	None	Coos County Airport District

Notes:
1. Coos Bay Public Works & Development Department, 2012
2. North Bend Public Works, 2012
3. Coos Bay Police Department, 2012
4. North Bend Police Department, 2012
5. Coos County Sheriff's Office, 2012
6. Coos Bay Fire Department, 2012
7. North Bend Fire Department, 2012
8. Bay Area Hospital, 2012
9. North Bend Medical Center, 2012
10. Coos Bay School District, 2012
11. North Bend School District, 2012

3.1 SEWAGE AND INDUSTRIAL WASTEWATER COLLECTION AND TREATMENT

3.1.1 Construction

A sanitation service would be contracted to provide and maintain portable toilets for the construction crew during construction. Maintenance will be determined following initial usage and adjusted according to the SDPP workforce at a given time. Sanitary wastes collected during periodic maintenance will be hauled off site to a permitted disposal facility.

3.1.2 Operation

It is anticipated that there will be approximately 45 permanent employees spread over three shifts daily. During operations, it is anticipated that sanitary wastewater will be managed onsite in a permitted onsite sewage disposal facility and disposed through the industrial wastewater pipeline. The volume of industrial wastewater is within the capabilities of the industrial wastewater pipeline.

During operation of the SDPP, wastewaters would include heat recovery steam generator blowdown, water treatment wastes, filter backwash, and oil/water separator effluent. Wastewaters will be disposed of through the industrial wastewater pipeline or transported offsite if they are not suitable for disposal through the industrial wastewater pipeline. Wastewaters will be collected onsite and treated, if necessary, before disposal. Once the composition of the wastewaters is confirmed and the appropriate treatment applied, the treated wastewater will be discharged to the industrial wastewater pipeline which has a minimum estimated capacity of 3.6 to 4 million gallons per day (gpd), significantly greater than the maximum estimated volume of wastewater from the SDPP (433,440 gpd).

Wastewaters that are not suitable for pipeline discharge will be collected as a separate waste stream and contained in on-site tanks designed for this operation or appropriate truck mounted tanks. The waste water will be characterized for transportation and disposal options. Depending on the final characterization of the wastewater's chemical properties these volumes will be sent offsite for treatment, storage, and or disposal. Both the City of Coos Bay and the City of North Bend maintain approved wastewater treatment plants that could accept this wastewater. In addition, PPV Inc., a wastewater treatment facility in Portland, Oregon, has more than adequate capacity to accept JCEP's anticipated wastewater. A written confirmation statement is provided in Appendix O-5, which confirms PPV Inc.'s ability to receive wastewater from the SDPP. For more detail regarding deposition of wastewater, see Exhibits O, Section 3.3 and V. No significant adverse impacts to service providers are anticipated.

3.2 WATER SUPPLIES

3.2.1 Construction

Water required for construction activities would be purchased from the Coos Bay North Bend municipal water system, which is managed by the Coos Bay North Bend Water Board (CBNBWB). The purchased water for construction activities would include potable water conveyed through one onsite connection to an existing 12-inch main. The potable water connection would be permanent and used for operations. A separate, temporary, untreated water connection from CBNBWB may also be installed to support construction activities; however, it is anticipated that the potable water supply will be sufficient for all construction activities.

The source water for the potable water would be from the Dunes Aquifer Wellfield, which is utilized for industrial and municipal purposes. The potable water used during construction would be sourced from the Dunes Aquifer Wellfield and treated at the North Spit Water Treatment Plant, which has a 1.0 million gallon per day (mgd) capacity. The Dunes Aquifer Wellfield consists of 18 production wells, which can produce up to four million gallons per day (gpd) of untreated water.[5] According to the December 29, 2009 CBNBWB Water Management and Conservation Program, the CBNBWB maintains current water appropriation rights of 29.7 million gallons per day from the Dunes Aquifer Wellfield.[6] The CBNBWB has a system capacity of 4,000 gpm.[7]

The Applicant estimates approximately 32 million gallons of water would be required during the 39-month construction phase. Table U-3 identifies the construction activity and corresponding estimated water usage rate. Details regarding construction water use are included in Exhibit O – Water Use.

The untreated water, if a temporary connection is installed, would be used during construction for dust control, washing equipment and vehicles, washing concrete trucks after delivery of

[5] Coos Bay North Bend Water Board, *Annual Report*, Fiscal Year 2011-2012.
[6] Coos Bay North Bend Water Board, *Water Management and Conservation Plan*, December 29, 2009.
[7] Coos Bay North Bend Water Board Transmittal Letter to Robert L. Braddock, Jordan Cove Energy Project L.P., September 5, 2013, attached as Exhibit O, Appendix O-1.

concrete loads, fire suppression during construction, and water supply for flushes, and testing and commissioning. Potable water would be required for items such as ice machines, coolers, and sinks for construction facilities to support construction personnel. Water may be trucked in until the municipal connection is operational and bottled water will likely be available in the construction trailers.

Table U-3 Estimated Construction Water Use

Activity	Estimated Usage Rate (gpm)	Estimated Total Water Usage (gal)	Water Source/System
Dust Suppression	400	1,140,000	Service
Site Civil Construction	400	6,000,000	Service
Underground Piping Hydrostatic Testing	400	750,000	Service
Water Storage Tank Hydrostatic Testing	900	2,250,000	Service
Above Ground Piping and Equipment Flushing and Hydrostatic Testing	400	5,400,000	Service
System Flushing	900	850,000	Service
Chemical Cleaning and Steam Blows	400	4,500,000	Demineralized
Demineralized water need between first fire and commercial operation			
HRSG Makeup	36	2,073,600	Demineralized
Combustion Turbines (CTs) nitrous oxide (NOx) Injection	305	8,784,000	Demineralized
Duct Firing	12	172,800	Demineralized

The applicant will emphasize water conservation to minimize losses during construction. Such conservation measures include leak detection and repair, recovery, reuse and recycling. Some waters will be lost, such as water used for dust control, civil work, and steam blow waters. Chemical cleaning waters will be collected and transported offsite for treatment. Opportunities will exist for reuse of some of the flushing and hydrostatic test waters for additional flushes or testing.

Based upon the total estimated water use during construction, the CBNBWB system capacity, and the Dunes Aquifer Wellfield production rate, there is sufficient water available for the duration of construction. As such, no significant adverse impacts to water supply are anticipated from construction of the project. A copy of the September 5, 2013 transmittal letter is included in Exhibit 0 – Water Use, Appendix O-1 Letter from the Coos Bay North Bend Water Board.

3.2.2 Operation

Water required for operation of the SDPP would be purchased from the CBNBWB municipal water system.

The source water for the potable water would be from primarily from the Dunes Aquifer Wellfield, which is utilized for industrial and municipal purposes. The potable water purchased for operations would be sourced from the Dunes Aquifer Wellfield and treated at the North Spit Water Treatment Plant, which has a 1.0 million gallon per day (mgd) capacity. Additional treated water is available from the Pony Creek Filtration Plant, which has a capacity of 12 MGD. The current peak treated water demand for the CBNBWB system is 6.02 MGD. Details regarding the water source for operations are the same as that for construction.

The primary consumptive uses of water during SDPP operation would be for steam cycle make-up water and pollution control; nitrous oxide (NOx) control injection water, both uses are for demineralized water. The treated source water would be demineralized onsite. Potable water, Storm Water service water, and fire water supply are comparatively minor uses.

Average daily operational water use is estimated at 806,400 gallons per day (gpd). The estimate for potable and sanitary systems use is approximately 4,300 gpd and is based on a 24-hour daily staff of 45 full time equivalents spread over three shifts per day. The estimated average and maximum daily operational water uses are summarized in Table U-4. Details regarding water use during operations are included in Exhibit O – Water Use.

Table U-4. Estimated Average and Maximum Water Use during Operations

Use	Source	Average Use Condition (gpm)	Maximum Use Condition (gpm)
Potable and Sanitary Systems	CBNBWB	**2**	**2**
Miscellaneous Drains and heat recovery steam generators (HRSG) Quench	CBNBWB	**65**	**79**
Demineralized Water Systems:	CBNBWB	**493**	**635**
CT NOx Injection	Demineralized on site	305	390

Steam Cycle Makeup	Demineralized on site	36	51
Demineralized to LNG Process[8]	Demineralized on site	6	6
Totals		**560**	**716**

Based upon the total estimated water use during operations, the CBNBWB system capacity, and the Dunes Aquifer Wellfield production rate, there is sufficient water available for operation of the SDPP. Further, in a letter dated September 5, 2013, the CBNBWB states that it can provide two, permanent potable water service connections and one, permanent raw water service.[3] The CBNBWB also states that the community's water supply and production needs, and the Applicant's water availability needs are comfortably accounted for.[3] As such, no significant adverse impacts to water sources are expected from operation of the project. A copy of the September 5, 2013 transmittal letter is included in Exhibit 0 – Water Use, Appendix O-1 Letter from the Coos Bay North Bend Water Board.

3.3 STORM WATER

3.3.1 Construction

Storm water runoff will not occur during most of the construction activities due to the high infiltration rate of the sandy soils on the SDPP site. Further discussion of soil conditions and infiltration is presented in Exhibit I and Exhibit V, where it is shown that the SDPP site is predominantly sand and that infiltrometer test results of the soils in March 2013 demonstrated that storm water will be infiltrated into the sand backfill. During the latter months of construction, as impervious surfaces in parking lots and roofed building areas increase, storm water that does not contact industrial process or hydrocarbon sources will be collected in drainage swales to infiltrate, evaporate, or be directed to the storm water infiltration pond. Any storm water that contacts hydrocarbon sources will be contained and directed to oil/water separators before discharge to the existing industrial wastewater pipeline.

The existing industrial wastewater pipeline extends generally east to west along the north side of the north property boundary and conveys wastewater to the Port's ocean outfall. The industrial wastewater pipeline is capable of conveying 3.6 to 4.0 million gpd. [9]

The volume of construction storm water that is discharged to the industrial wastewater pipeline will be limited to storm water that contacts pollutants other than those allowed by the Construction Stormwater Discharge Permit (1200-C). It is anticipated that such storm waters will be significantly less than the carrying and outfall capacity of the industrial wastewater pipeline; therefore no significant adverse impacts are anticipated.

[8] The quantity of demineralized water in the Average Use and Maximum Use columns does not add up to 493 and 635, respectively, due to the process of demineralizing water and disposal of concentrates.
[9] Oregon International Port of Coos Bay Transmittal Letter to Robert L. Braddock, Jordan Cove Energy Project L.P., August 6, 2013, attached as Exhibit V, Appendix V-1.

3.3.2 Operation

Following construction, disturbed areas of the site will be stabilized, using approved erosion control measures, until vegetation is reestablished or permanent cover is applied. Non-contact storm water that does not immediately infiltrate, will be conveyed through a series of vegetated ditches/swales and underground storm water pipe before discharging into the new storm water infiltration pond. Biofilters will be installed in ditches at specific locations around the site perimeter. The biofilters will convey and allow the infiltration of storm water and will also remove contaminants from storm water.

Storm water that comes into contact with, or has the potential to contact, hydrocarbons will be discharged to the industrial wastewater pipeline. Such waters will be diverted to an oil/water separator that will discharge into a new sump before being routed to the industrial wastewater pipeline.

As noted previously, the industrial wastewater pipeline is capable of conveying 3.6 to 4.0 million gpd. It is estimated that the maximum daily volume of process wastewater discharged to the industrial wastewater pipeline will not exceed 433,440 gpd (refer to Figure O-1). Contact storm water discharged to the industrial wastewater pipeline will be significantly less than the remaining capacity of the pipeline (3.5 million gallons), so no significant adverse impacts to the industrial wastewater pipeline are anticipated.

3.4 SOLID WASTE

3.4.1 Construction

During SDPP construction, a variety of non-hazardous, inert materials would be generated. Solid waste would consist of materials such as domestic refuse, office waste, packaging materials (e.g., pallets, cardboard, packing paper, steel banding), steel cut-offs, and construction materials such as concrete waste, wood, plastic, glass, erosion control materials, and miscellaneous debris. Only materials that cannot be recycled will become wastes. Paper products (including office waste and packaging), wood, most erosion control materials, metals, glass, and plastics will be sorted and recycled. It is estimated that approximately five tons per month of solid waste would be produced during construction, which is estimated to be approximately 39 months.

Non-hazardous waste that cannot be recycled would be transported to an approved landfill and is expected to have a minimal impact on the local community as multiple regional solid waste providers are prepared to ship solid waste to landfills outside Coos County. While the final disposal site has not been determined, one option is the Dry Creek Landfill in Eagle Point, Jackson County, located about 180 miles southwest of the proposed SDPP project site, which is available for non-hazardous solid waste. The Dry Creek Landfill also offers recycling services and accepts approved construction debris, which will be separated from other non-hazardous wastes. Two other regional solid waste companies have indicated that their operations have capacity to meet this solid waste disposal demand. These include Republic Services in Corvallis, OR and Waste Management in Arlington, OR. A summary of the identified waste disposal facilities and their capacity to receive waste is included below in Table U-5. Written confirmation demonstrating that the identified waste disposal facilities have adequate capacity available to receive non-hazardous solid waste from the SDPP is included in Appendix U-1.

Table U-5. Waste Disposal Facility Information

Facility	Non-Hazardous	Construction Debris	Hazardous Waste	Available Capacity
Dry Creek Landfill 8001 Table Rock Rd. White City, OR 97503	Yes	Yes	No	Yes
Waste Management Columbia Ridge Landfill 18177 Cedar Springs Ln. Arlington, OR 97812	Yes	Yes	No	Yes
Republic Services Coffin Butte Landfill 29175 Coffin Butte Rd. Corvallis, OR 97330	Yes	Yes	No	Yes
Chemical Waste Management of the Northwest Landfill 17629 Cedar Springs Lane Arlington, OR 97812	No	No	Yes	Yes
U.S. Ecology 20400 Lemley Road Grand View, ID, 83647	No	No	Yes	Yes
Clean Harbors Aragonite Incineration Facility Aragonite Rd Grantsville, UT 84029	No	No	Yes	Yes
Written confirmation demonstrating that the identified waste disposal facilities have adequate capacity available to receive waste from the SDPP is provided in Appendix U-1.				

With regard to hazardous wastes, the SDPP is expected to be either a small quantity generator (SQG), a SQG produces more than 100 kilograms per month (kg/mo) but less than 1000 kg/mo, or a conditionally-exempt small quantity generator (CESQG) of hazardous wastes (a CESQG produces less than 100 kg/mo) during both construction and operation. At a production rate of less than 100 kg/mo to up to a maximum of 1000 kg/mo, fewer than one truckload of hazardous waste would be transported every three months. Quantities during construction will vary from zero generation to potentially more than 100kg/mo depending on construction and commissioning activities underway during a given month, but is not anticipated by the Applicant to exceed 1000 kg/mo in any given month of construction. Factors which may cause a variance in the amount of waste are periodic or seasonal maintenance or repairs. One example of this is that cleaning operations will result in an accumulation of waste at a ‘satellite accumulation area’ next to the maintenance process. When the accumulated volume finally exceeds 55-gallon drums, the drum will need to be sealed and the operator has three days to move the drum from the ‘satellite accumulation area’ to the storage area. For a SQG or a CESQG, accumulation of 55-gallons of hazardous waste may take several months.

Unless recycled, potential wastes would include oily rags, spent batteries, and equipment and vehicle maintenance solvents and oils.

Hazardous wastes will be segregated from and kept in a separate storage area away from non-hazardous materials. Waste storage areas will be inspected at least weekly and wastes will be removed from the project site by licensed transporters to landfills permitted to accept the wastes. The hazardous waste disposal sites to be used by the SDPP have not been selected at this time. However, there are currently three permitted commercial hazardous waste facilities within reasonable proximity to the SDPP and are operated by Chemical Waste Management, U.S. Ecology (formerly EnviroSafe Services), and Clean Harbors (formerly Laidlaw)[10] (located in Oregon, Idaho, and Utah, respectively) and all three are available to receive hazardous waste from the SDPP (CWM, 2014; U.S. Ecology, 2014; Clean Harbors, 2014). A summary of the identified waste disposal facilities and their capacity to receive waste is included above in Table U-5. Written confirmation demonstrating that the identified waste disposal facilities have adequate capacity available to receive hazardous waste from the SDPP is included in Appendix U-1.

The use of hazardous materials will be kept to a minimum, and wastes will be recycled to the extent practicable. Please refer to Exhibit V for a discussion of the waste minimization program.

3.4.2 Operation

Non-hazardous solid waste generated during operation would not have significant adverse impacts to communities in the analysis area. As discussed in Exhibit V, solid waste generation is expected to be approximately ten tons per year. Transportation and disposal services for such waste will be contracted to a local provider, which currently includes Waste Management, Waste Connections/Dry Creek Landfill, and Republic. Non-hazardous solid waste is transported by Waste Connections to the Dry Creek Landfill, which has an estimated capacity of 65,512,400 tons (Dry Creek, 2014), Waste Management has an estimated capacity of 143 years of life remaining for their Columbia Ridge Landfill and Recycling Center (WM, 2014), and Republic Services has approximately 40 years of capacity remaining at their Coffin Butte Landfill (Republic, 2014). Because the three disposal services for solid waste have capacity to accept the aforementioned quantities of waste and the SDPP is only expected to generate 10 tons per year, there is adequate capacity to accept solid waste generated by the SDPP with no significant impact to disposal service providers. Written confirmation demonstrating that the identified waste disposal facilities have adequate capacity available to receive hazardous waste from the SDPP is included in Appendix U-1. A summary of the identified waste disposal facilities and their capacity to receive waste is included above in Table U-5.

As discussed above, the amount of hazardous waste produced during operation of the facility is expected to allow the site to be designated as either a SQG or a CESQG (see Exhibits E and V). While the hazardous waste treatment and disposal facilities have not been selected, the closest sites include facilities in Oregon, Idaho, and Utah. Transportation services would be provided by licensed hazardous waste transporters.

[10] Clean Harbors purchased the disposal facility in 2005.

In summary, waste materials will not have significant adverse impacts during construction or operation for the following reasons:

- The Applicant assumes that a waste minimization program will recycle materials, monitor waste production to reduce wastes, and replace hazardous materials with non-hazardous options whenever suitable replacements are available. This program will reduce volumes of wastes produced (both hazardous and non-hazardous wastes) at the SDPP. The program and production rates are further described in Exhibit V.
- The anticipated volumes of non-hazardous and hazardous waste generated during construction and operation of the SDPP has been minimized, so the additional trips per month between the site and disposal facilities will not have an adverse impact on the transportation network.
- In addition to the Dry Creek Landfill, which may be used for disposal of construction debris or other non-hazardous wastes, there are other DEQ- permitted landfills that could be used.
- Other facilities provide specialized services (e.g., used oil, composting of wood and vegetative debris, tires, metals, and paper recycling) providing options other than disposal for most non-hazardous waste.
- As either a small quantity or conditionally-exempt small quantity generator of hazardous waste, the low frequency of "trips" from the site to offsite disposal sites will not result in significant adverse impacts.
- The hazardous waste disposal facilities considered for this application are large commercial facilities located well outside the analysis area. The volume of waste generated by the SDPP would represent an insignificant increase in the waste managed at these sites.

For additional details, see Exhibits V and W.

3.5 POLICE AND FIRE

The Southwest Oregon Resource Security Center (SORSC) to be located off Jordan Cove Road, west of the main body of the SDPP site, will provide security, fire protection, and emergency services. The SORSC is regulated under the Federal Energy Regulatory Commission and as such, is not considered a supporting or related facility under the Energy Facility Siting Council's jurisdiction. In accordance with the June 2014 Memorandum of Understanding (MOU) between Jordan Cove Energy Project (JCEP) and the State of Oregon, the SORSC personnel and equipment will be in place 30 days prior to operation of the SDPP. The MOU requires JCEP to provide funding at the county level for a fire training center as well as analysis of the available resources.[11] The proposed construction schedule is to begin work in 2016, and complete the

[11] Memorandum of Understanding and Agreement No. 14-008 by and between Jordan Cove Energy Project and the State of Oregon for LNG Emergency Preparedness dated June 10, 2014. Attached as Exhibit B, Appendix B-1.

SDPP in September of 2019, with peak construction occurring during summer of 2018.[12] Construction of the SORSC would be concurrent with or prior to the SDPP construction.

During construction, the average number of construction personnel for the 39-month construction duration is estimated to be 500. [13] It is further estimated that approximately 50 percent of the construction work force will be hired locally (Appendix U-7).[14] In the case of locally hired construction personnel (200 to 300 individuals), there would be no significant impact to police or fire because that population would already be included with and accounted for in terms of emergency response complying with state or federal staffing levels.

Similarly, it is possible that approximately 200 to 300 construction personnel would be from distances such that those workers would temporarily relocate during construction, but the skills and staffing needed will vary during the 39-month construction duration. Local police and fire departments would be dispatched in the event of an emergency, but the need of such responses is expected to be minimal.

The Coos County 2013 population estimate is 62,282.[15] As previously mentioned, it is estimated that up to 300 construction personnel would temporarily relocate for the duration of their construction assignment at the SDPP; temporarily increasing the Coos County population to 62,582. This is a temporary population increase of approximately one percent. Because the increase is only one percent, the impact is anticipated to be negligible; thus, no significant adverse impacts on county police or fire departments listed below are anticipated during construction.

The above information pertains to the county level because it is not known in which communities the temporarily relocated construction workers would reside. Further, it is unlikely that all temporarily relocated construction workers would reside exclusively within either Coos Bay or North Bend. If as many as 300 construction personnel temporarily relocated exclusively to Coos Bay or North Bend, it is expected that those personnel would reside in houses or hotels that are already established and represented in the city's police and fire department staffing levels. Thus, no significant adverse impacts to city police or fire departments listed below are expected during construction.

Construction of the SORSC must be completed prior to operation of the JCEP facilities. As such, the SDPP will have security and emergency responders at the time of operations. It is estimated that there will be approximately 45 total personnel over three shifts per day during operations of the SDPP. It is possible that, depending upon the emergency at SDPP, County

[12] Traffic Impact Analysis, Appendix U-2, Section 4. Background Conditions.
[13] Notice of Intent to Apply for a Site Certificate for the South Dunes Power Plant, Coos County, Oregon, Submitted by the Jordan Cove Energy Project, L.P., Submitted to the Oregon Energy Facility Siting Council, August 2012. The estimate of 500 workers continues to be the current anticipated number of construction workers. This same number was used in the current Traffic Impact Analysis, attached as Appendix U-2.
[14] See Section 2.0 of this Exhibit; see also Appendix U-7 ECONorthwest, 2012, pages 5 and 10. An Economic Impact Analysis of the Construction of an LNG Terminal and Natural Gas Pipeline in Oregon; and Appendix U-5 ECONorthwest, 2012 page 7.
[15] U.S. Census Bureau, http://quickfacts.census.gov/qfd/states/41/41011.html, site accessed April 4, 2014.

and/or city police and/or fire department personnel could be dispatched to support emergency responders from the SORSC. No significant impacts to county or city police or fire departments listed below are expected due to operation of the SDPP because the SORSC will have personnel and firefighting apparatus. At a minimum the SORSC will have at least three pumpers, one ladder truck (or a combination apparatus with equivalent capabilities), other specialized apparatus as may be needed, no fewer than 16 firefighters, one chief officer, one safety officer, and a Rapid Intervention Team (four - five fire fighters on standby at event scene) as required by the MOU, attached as Appendix B-1, Section V(1)(a).

3.5.1 Coos County Sheriff's Office

The Coos County Sheriff's Office is headquartered in Coquille (the County Seat of Coos County), approximately 17 miles from the project site. The Sheriff's Office provides police services to the residents of Coos County not located within cities. Coos County covers an area of approximately 1,596 square miles (US Census Bureau Quick Facts, 21 November 2012). Coos County reports to have 25 full time police officers and 17 other police employees. [16] The category of other police employees includes one supervisor and 11 dispatchers.

Emergency dispatch services for Coos County are provided by the County Communications Center located at the Sheriff's Office. The dispatch center operates 24-hours a day and provides the county with 911 capabilities for fire, police, and medical emergencies (Coos County, County website. http://www.co.coos.or.us, Accessed 21 November 2012). In addition to the emergency communications center, the County Sheriff's Office provides law enforcement services and supports the County Courthouse, serving papers and assuring security to the court (http://www.co.coos.or.us/departments/sheriffoffice.aspx).

3.5.2 Coos County Fire Protection Districts

Coos County has several rural fire protection districts, with the closest one, the Hauser Rural Fire Protection District, located to the north beyond the study area. The Hauser Rural Fire Protection District has a volunteer staff of one paramedic, four emergency medical technicians, and 14 first responders (Hauser Fire and Rescue, 2012). The SDPP site is located outside of their district and is not expected to have any impacts to the services provided to the district.

3.5.3 City of Coos Bay Police Department

The City of Coos Bay Police Department is responsible for all law enforcement activities within the City of Coos Bay. The Department contains 38 staff members. The department includes the Chief of Police and 18 officers, plus three Detectives, one Traffic Enforcement Officer, and a School Resource Officer. Non-sworn staff and volunteers are used in the Communications Division, which operates the 911 system (Coos Bay Police Department, 2012).

[16] U.S. Census Bureau, 2012 Census of Governments: Employment, U.S. Census Bureau http://www.census.gov/govs/apes/, site accessed April 4, 2014.

3.5.4 City of Coos Bay Fire Department

The City of Coos Bay Fire and Rescue Department has two manned stations and a third, unmanned facility, known as the Eastside Station. The department is made up of the Fire Chief, three Battalion Chiefs, three Lieutenants, nine career firefighters/ engineers, and 15 volunteer firefighters. Additionally, there are opportunities for student firefighters enrolled in the fire science program at Southwestern Community College (Coos Bay Fire Department, 2012).

3.5.5 City of North Bend Police Department

The City of North Bend Police Department is responsible for all law enforcement activities within the City of North Bend and is comprised of the Patrol Division, with 14 uniformed officers, plus the Detective Division, Administration, Dispatch, Records and Communications, and the K-9 Unit. The Department also contains Reserve Officers. There are a minimum of two to four officers on duty per shift (North Bend Police Department, 2012).

3.5.6 City of North Bend Fire Department

The North Bend Fire Department includes 11 paid personnel, the Chief, an Assistant Chief, a Captain, three shift Lieutenants, and 6 firefighters. Additionally, there are 32 trained volunteer firefighters available to respond to calls (North Bend Fire Department, 2012).

3.5.7 State Police

The Oregon State Police number 672 personnel.[17] There is an Oregon State Police Coos Bay Area Command post, which is located in North Bend. They patrol state highways and provide services to support local communities with a variety of programs, including forensic services, computerized data, emergency response, and other specialized services.

Given the ample resources listed above and the small overall population increase of construction workers (approximate population increase of 1 percent), and that the SDPP will have their own designated response facility during operations (the SORSC), the Applicant will not have an adverse impact on police and fire departments in the community.

3.6 HEALTH CARE

Coos County has a population of 63,043 people spread over 1,600 square miles, which is an average of 39.5 people per square mile.[18] An analysis of the available health care resources in the vicinity of Coos Bay and North Bend was conducted to determine the potential effect on the available resources during both the construction and operation phases of the SDPP.

The analysis indicated that the available health care resources can handle the routine medical emergencies that commonly occur during the construction and operation of the SDPP project without taxing the available resources or lowering the level of care that is currently available to

[17] U.S. Census Bureau, 2012 Census of Governments, Individual Government Data and ID File, http://www.census.gov/govs/apes/index.html, Part 10, site accessed April 4, 2014.
[18] http://www.co.coos.or.us/

Coos Bay and North Bend. More complicated cases would be dealt with through medical evacuation to resources in Portland or other larger cities nearer to Coos Bay and North Bend.

An analysis of facilities found that there are 3 acute care hospitals in Coos County, with a total of 171 beds currently existing and 223 beds currently licensed by the state. Within the City of Coos Bay, the Bay Area Hospital is licensed for 172 beds and currently has 130 existing beds for acute care (Bay Area Hospital, 2014).

The Bay Area Hospital in Coos Bay is an accredited medical facility located approximately 6 miles from the SDPP project site. This facility completed a major expansion in February 2013. The facility has more than 1,000 employees and 130 physicians[19]. It is capable of handling all routine and all but the most severe emergency medical needs of personnel during construction and operation of the SDPP (Bay Area Hospital, 2012). The Bay Area Hospital offers the following medical services:

Bariatric Center	Medical Oncology/Hematology
Bariatric Surgery	Oncology Nursing
Cancer Center	Orthopedics Center
Cancer Registry	Palliative Care
Cardiac Rehab	Pediatrics
Cardiovascular Care	Pharmacy
Clinical Trials	Psychiatric Services
Critical Care	Pulmonary Rehabilitation
Emergency Department	Radiation Therapy Center
Family Birth Center	Rehabilitation Services
Home Health	Sleep Center
Imaging Services	Surgical Department
Lab and Pathology Services	Urology Center

Additionally, the North Bend Medical Center has a clinic located in Coos Bay (North Bend Medical Center, 2012). Both facilities are located south of the project site. Two additional hospitals, the Lower Umpqua Hospital and Coquille Valley Hospital, are also located within close proximity to the SDPP at distances of approximately 20 miles north and 25 miles south, respectively. A summary of the number of beds available at each of the aforementioned hospitals is included in Table U-6 below. Written confirmation from each of the hospitals regarding the number of licensed and available beds is provided in Appendix U-2.

[19] Coos County Public Health, Community Health Assessment, Coos County, 2013.

Table U-6. Hospital Capacities

Hospital	# of Licensed Beds	# of Existing Beds
Bay Area Hospital 1775 Thompson Road Coos Bay, OR 97420	172	130
Southern Coos Hospital & Health Center 900 11th St. SE Bandon, OR 97411	21	16
Coquille Valley Hospital	30	25
Totals Beds	**223**	**171**
Hospital capacity confirmation statements are provided in Appendix U-2.		

A Community Health Assessment comparing Coos County to the national benchmark and Oregon hospitals states that the county is classified as a Medically Underserved Area, particularly for service needs for low income, homeless, and those with mental health issues[20]. The report indicates that the capacity to provide adequate medical care is particularly acute for rural residents in Coos County that may not have ready access to hospitals and clinics in the county. The report discusses access to healthcare, but also community issues (e.g., chronic illness management, dental health, maternal and child health, mental health, socioeconomic disparities, illness prevention, and lack of transportation from rural areas to healthcare providers). While such a broad discussion is valuable from a community perspective and contributed to the determination that the County is "medically underserved", most of these factors would not be exacerbated during construction or operation, due to the small number of out-of-town workers and the fact that the employees will be highly-skilled experts in their field and will be gainfully employed and thus, are highly unlikely to fall into the above socioeconomic factors and categories listed above.

The local medical facilities, including three acute care hospitals in Coos County, capable of handling all routine and all but the most severe emergency medical needs of personnel during construction and operation of the SDPP with a total of 171 beds currently existing and 223 beds currently licensed by the state, have the capacity to address any increase in patients during construction or operation of the SDPP. Specifically, the Bay Area Hospital, located nearest the SDPP project site at a distance of approximately 6 miles, reported that it has adequate capacity with 130 beds currently staffed and could potentially increase their capacity to 172 beds per their existing state issued license. In the event of a natural disaster or catastrophic event, the Bay Area Hospital can temporarily increase their capacity with tent triage (Bay Area Hospital, 2014). The Southern Coos Hospital and Health Center, the second nearest hospital to the SDPP project site at a distance of approximately 20 miles, is a rural hospital that could presently staff 16 beds and could potentially increase their capacity to 21 beds per their existing state issued license. In the event of a natural disaster or a catastrophic event, the Southern Coos Hospital and Health Center can temporarily increase their capacity with a triage tent equipped with an additional 6 beds

[20] Coos County Public Health, Ibid

(Southern Coos Bay 2014). The Coquille Valley Hospital, the third nearest hospital to the SDPP project site at a distance of approximately 25 miles, can presently staff 25 beds and could potentially increase their capacity to 30 beds per their existing state issued license. In the event of a natural disaster or catastrophic event, the Coquille Valley Hospital can temporarily increase their capacity with tent triage (Coquille Valley Hospital, 2014). Written confirmation of the aforementioned hospital's capacities is included in Appendix U-2.

Jordan Cove management personnel and/or construction managers will choose an Engineering, Procurement, and Construction (EPC) contractor(s) with a satisfactory safety record to complete the SDPP project. Such contractors routinely have an environmental health and safety program, accident prevention, and other programs in place to minimize both the chance of injuries as well as the severity of such injuries, thereby minimizing the need for emergency services or the support from local health care services in Coos County.

Significant adverse impacts to the availability of community health services are not anticipated because:

- Due to the short duration of construction assignments (typically less than one year), the population increases will mostly be limited to construction workers (family members generally will not relocate to construction area);
- The project will result in only an additional 500 personnel throughout the entire construction period and approximately 45 personnel during facility operation. It should be noted that the average personnel present during construction will be fewer than 500, it will only be during the peak construction period during the summer of 2018 where all 500 may be present. It is expected that 200 to 300 of the construction personnel will be local hires and some of the new full-time operation personnel will already reside in the analysis area; therefore, the expected population increase of less than 1 percent will be temporary;
- The Bay Area Hospital is the largest coastal hospital in Oregon. Public and private health care providers in the Coos Bay/North Bend area include 3 hospitals with 218 beds and 1 public health clinic; and
- The firms selected as the contractors for the project will be those that can demonstrate a consistent exemplary safety culture.

3.7 PUBLIC EDUCATION

The SDPP construction site is within the North Bend School District. See Figure U-1, which illustrates the North Bend and Coos Bay School District boundaries. The nearest school to the SDPP site is Oregon Virtual Academy, about 1.5 miles south of the site in North Bend. At that distance, and in particular since it is an online school with no students on site, it is unlikely that the construction and operation of the SDPP would have any effect on the school. The nearest school with students on site is North Bend High School, approximately 2 miles south of the south end of the project site.

Given the temporary nature of the SDPP construction project, it is unlikely that much of the non-local construction workforce would take up residence with their school-age children. It is estimated that the entire Jordan Cove Energy Project will add an additional 22 school-age children to the public school system during the first school year, and approximately 125 students during the subsequent two school years. It is expected that a fraction of the aforementioned school-age children will be related to the construction of the SDPP (Appendix U-5).[21] According to the Oregon Department of Education, the number of student enrollments in the Coos Bay School Districts has fallen from 2007 to 2014 by 506 students.[22] In the North Bend School District, from 2007 to 2014, the number of student enrollments increased by 1,901. All but 200 of the increased students were enrolled at the Oregon Virtual Academy.[23]

It is estimated that approximately 45 permanent full-time positions will be provided during operation of the SDPP, with many from the local area. The local schools have adequate resources to serve their school-age children. The influx of construction workers for the proposed facility could result in some families moving to the area, and permanent employees required to operate the generating station could also impact local schools. While additional staff will be required for periodic maintenance of the SDPP, the short-term nature of such maintenance would not result in a permanent staffing increase or the addition of school-age children in the system.

Due to the staffing numbers, no significant adverse effects are expected, as capacity exists in each of the potentially affected school districts, as described below. The decline in school-aged population for North Bend, Coos Bay, and Coos County are summarized in Table U-7.

Table U-7. Population Trend Data for School-Age Children for Communities in the Analysis Area

School District	2000	2010	Change
Coos Bay			
Total District[24]	4,029	3,417	-15.2%
North Bend			
Total District [25]	2,682	2,694	0.4%
Coos County			
Total District	6,711	6,111	-8.9%

Source: Center for Population Research and Census, Portland State University, 2012

[21] ECONorthwest. 2012, page 21. The Impact of the Jordan Cove Energy Project on Coos County Housing and Schools.
[22] Oregon Department of Education, Student Enrollment Comparison, 2006 – 2007 and 2013-2014, http://www.ode.state.or.us/sfda/reports/r0062Select2.asp, site accessed April 4, 2014.
[23] Oregon Department of Education, Student Enrollment Comparison, 2006-2007 and 2013-2014, http://www.ode.state.or.us/sfda/reports/r0062Select2.asp, site accessed April 4, 2014.
[24] Oregon Department of Education, Student Enrollment Comparison, 2000 and 2010, http://www.ode.state.or.us/sfda/reports/r0062Select2.asp, site accessed April 4, 2014.
[25] Oregon Department of Education, Student Enrollment Comparison, 2000 and 2010, http://www.ode.state.or.us/sfda/reports/r0062Select2.asp, site accessed April 4, 2014.

3.7.1 North Bend School District

The North Bend School District has three elementary schools (one is a charter school), a middle school, a high school, a technology magnet school, and an online school (North Bend School District, 2012). The North Bend School District has a maximum capacity of 4,056 students and 2,480 students are currently enrolled. Specifically, Hillcrest Elementary School has a capacity of 594 students with 478 students currently enrolled, North Bay Elementary School has a capacity of 870 students with 444 students currently enrolled, North Bend Middle School has a capacity of 992 students with 767 students currently enrolled, and North Bend High School has a capacity of 1,600 students with 739 students currently enrolled (North Bend School District, 2014). Based on the numbers provided, the North Bend School District has a 64 percent potential for growth, while the SDPP project is expected to cause an increase of less than 2 percent of school-age children in the North Bend School District. Therefore, the SDPP is not expected to have any significant adverse effects on the local public education system. Written confirmation regarding the North Bend School District capacity is provided in Appendix U-3.

3.7.2 Coos Bay School District

The Coos Bay School District has two K-3 primary grades, two intermediate schools for grades 4 through 7, and one high school serving grades 8 through 12 (Coos Bay School District, 2012). According to the Coos Bay School District, 3,131 students were enrolled as of October 2014 and two of their elementary schools were at capacity. Based on projections, the District is considering reopening a school in 2015 that was closed in 2011. Additionally, another previously closed school could be brought back into use with some capital improvements. With the existing facilities and the reopening of the two previously closed facilities, the Coos Bay School District could accommodate an increase of 600 to 700 students (Coos Bay School District, 2014). Based on the numbers provided, the Coos Bay School District has a 46 percent to 53 percent potential for growth, while the SDPP project is expected to cause an increase of less than 2 percent of school-age children in the Coos Bay School District. Therefore, the SDPP project is not expected to have an adverse impact on the local public education system. Written confirmation regarding the Coos Bay School District capacity is provided in Appendix U-3.

3.8 HOUSING

There are approximately 11,775 housing units within the cities of Coos Bay and North Bend. Based on 2009 to 2011 estimates, on average, there are a total of 7,325 housing units in Coos Bay and 4,450 units in North Bend. Coos County contained 30,593 units, with 3,977 as vacant units (a 13% vacancy rate) (US Census, 2010). Housing availability and supply in the analysis area is described in Table U-9.

It is estimated that an average of 500 workers would be at the SDPP site during the 39 month construction. Somewhere between 40% and 60% of the construction workers would likely be hired locally (200 to 300 workers would not be local hires).[26] Thus, no housing issues would be

[26] This is based upon Black & Veatch's experience with other construction projects in mid-sized Oregon communities and number of available experienced construction workers, see Section 2.0.

created for those workers. As work progresses, it is estimated that the average worker would be on site for about 12 months. In that situation, most workers would seek temporary accommodations available within a commuting distance of the SDPP site. The Applicant has approval for a conditional use permit and variance for temporary workforce housing to accommodate construction workers that was approved by the City of North Bend Planning Commission.[27] (City of North Bend, CUP-1-14 and VAR-1-14.) The temporary workforce housing would accommodate 2,100 construction workers, which is more than adequate to house all construction workers for the SDPP. It is expected that temporary workers will either live in their existing community within the region or obtain temporary housing in the region, such as the temporary workforce housing.

Coos County population grew by a negligible amount (0.4%) between 2000 and 2010, but it is still about 1,000 residents below its 1980 population. Of the existing housing units in Coos County, there is a vacancy rate of 11.3% or about 3,460 non-seasonal vacancies in housing units available for workers. In addition, there are about 1,236 available motel and other temporary housing units within Coos County.[28]

Not all workers will use housing units. Many workers from out of the local area are expected to bring campers or trailers and use the many campgrounds and trailer parks for their housing during construction. The following is a list of recreational vehicle sites within 75-minutes of North Bend, Oregon.[29]

Table U-8. Recreational Vehicle Site Supply within 75-Minutes of North Bend, Oregon, 2012

Name	Closest Town	Sites
Alder Acres	Charleston	100
Alder Acres RV Park	Coos Bay	88
Arbe's RV Park	Coos Bay	100
Arizona Beach RV Park & Motel	Port Orford	160
B & E Wayside Motel & RV Park	Florence	25
Bandon by the Sea	Bandon	72
Bandon RV Park	Bandon	41
Bastendorff Beach County Park	Coquille	89
Beach Loop RV Village	Bandon	25
Bluebill (7 Mo. Season)	Reedsport	18
Bullards Beach State Park	Bandon	198
Cape Blanco State Park	Port Orford	82
Carl G. Washburne	Florence	58
Carter Lake (6 Mo. Season)	Reedsport	45

[27] As of October 26, 2014 this decision is currently on appeal before the Land Use Board of Appeals.
[28] U.S. Census Bureau, General Housing Characteristics Coos County, Oregon: 2010, 2010 Census Summary File 1, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_SF1_QTH1, site accessed April 4, 2014.
[29] Appendix U-5, page 18, Table 9.

Table U-8. Recreational Vehicle Site Supply within 75-Minutes of North Bend, Oregon, 2012

Charleston Marina RV Park	Charleston	108
Darlings Resort	Florence	41
Discovery Pointe RV Park	Winchester Bay	138
Driftwood II	Reedsport	67
Edison Creek BLM	Port Orford	27
Eel Creek RV	Lakeside	50
Elk River Campground	Port Orford	50
Evergreen RV	Port Orford	15
Florence Elk Judd Huntington	Florence	40
Harbor Vista County Park	Florence	72
Heceta Beach RV Park	Florence	52
Horsfall	Reedsport	36
Humbug Mountain State Park	Port Orford	94
Jessie M. Honeyman State Park	Florence	357
Kelley's RV Park	Coos Bay	38
KOA Bandon-Port Orford	Langlois	70
Lagoon Campground	Reedsport	39
Lakeshore RV Park	Florence	20
Loon Lake Lodge	Reedsport	100
Lucky Loggers	Coos Bay	78
Mercer Lake Resort	Florence	28
Midway RV Park	Coos Bay	59
North Lake Resort (8 Mo. Season)	Lakeside	100
Ocean Pines RV	North Bend	88
Oceanside RV Park	Charleston	71
Oregon Dunes KOA	North Bend	62
Osprey Point RV Resort	Lakeside	132
Pacific Pines	Florence	64
Port of Siuslaw RV & Marina	Florence	105
Port Orford RV Village	Port Orford	30
Robbin's Nest RV Park	Bandon	20
Salmon Harbor	Winchester Bay	166
Sixes River	North Bend	19
Snug Harbor	Charleston	10
South Jetty NACO	Florence	200
Spinreel	Reedsport	37
Sunset Bay Sate Park	Coos Bay	63
Surf Wood Campground & RV Park	Reedsport	170
Sutton CG	Florence	79
Tahkenitch	Reedsport	26
Tahkenitch Landing (15 week season)	Reedsport	29
Tenmile Lake	Lakeside	46

Table U-8. Recreational Vehicle Site Supply within 75-Minutes of North Bend, Oregon, 2012

The Firs RV Park	North Bend	88
The Marina RV Resort	Winchester Bay	118
The Mill Casino	North Bend	102
Three Rivers Casino	Florence	100
Tyee Recreation Site	Reedsport	16
Umpqua Lighthouse State Park	Winchester Bay	50
Waxmyrtle (5 Mo. Season)	Reedsport	55
Wild mare Horse Camp	Reedsport	12
William M. Tugman State Park	Coos Bay	115
Winchester Bay	Winchester Bay	138
Windy Cove County Park	Winchester Bay	24
Woahink Lake RV Resort	Florence	78

In summary, there is adequate housing stock in the Coos County/Coos Bay/North Bend area to accommodate the work force during construction of the SDPP. Operation of a gas-fired power plant involves relatively few people, approximately 45 full-time jobs. Housing in the Coos Bay/North Bend area should be able to accommodate this workforce without significant or adverse impacts.

Table U-9. Permanent Housing Supply and Availability in the Analysis Area

City	Total Housing Units	Vacancy Rate
Coos Bay, OR	7,325 units	6.2%
North Bend, OR	4,450 units	7.6%
Coos County, OR	30,593 units	13.0%
TOTAL	42,368 units	

Source: Community Profiles from the US Census, American Community Survey Estimates 2009-2011(http://factfinder2.census.gov, Accessed 26 November 2012)

In summary, the proposed SDPP would impose no new demand on local utility and service providers for either construction-related or operation-related needs. As described, the facility would be supplied with process, cooling, and potable water from the CBNBWB that has ample capacity to provide these services. Storm water run-off will be managed onsite.

Construction workers from outside the region would be utilized as needed. However, it is likely that many personnel will be able to commute from permanent residences during the week, and that the existing industrial base/ skilled labor in the region will be an important component to the labor used on the SDPP project.

In general, it is not anticipated that workers would bring their families because of the short duration of the work. The addition of a small number of temporary residents to the analysis area is expected to have no adverse impact on the demand for water supply, sewerage service, health care, and police and fire services.

The proposed energy facility will create about 45 full-time jobs per day over the course of the lifetime of the facility. The new jobs would pay considerably above the average wage and would likely be attractive to current residents. It is expected that some of the new employees already reside in the analysis area. Creation of the new jobs would have a minimal effect on the demand for local services.

3.9 TRAFFIC

Construction and Operation: Access to the SDPP site will be from the TransPacific Parkway via Oregon Coast Highway (US 101). The TransPacific Parkway also provides access to each of the industries on the North Spit, as well as to the Oregon Dunes National Recreation Area. The intersection of the TransPacific Parkway and US 101 (approximately one mile east of the site) is not currently signalized. As discussed in Appendix U-2, the increase in traffic demands would have no significant impacts to traffic on US 101 as a result of construction or operations from the SDPP facility. Affected intersections along both TransPacific Parkway and US 101 are expected to meet all jurisdictional standards both during construction and operation of the SDPP facility. There will be no need for additional police services to assist in the direction of traffic at the SDPP site entrance on TransPacific Parkway or at the intersection of TransPacific Parkway and US 101. Therefore, no adverse impacts from traffic would be expected to public and private facilities that are accessed from US-101.

During construction, facility-related traffic would consist of material deliveries arriving on site and construction workers. It is anticipated that construction of the SDPP would last approximately 36-39 months, and employ up to 500 workers maximum (across multiple shifts) during the peak of construction. Because of the number of workers required and the lack of available parking areas near the SDPP site, workers will predominantly be transported to the site by approximately 13 buses or other transit vehicle, alleviating a large influx of vehicle traffic at shift changes. Buses would arrive from the south along US 101.

One potential impact to traffic safety was recognized resulting from construction of SDPP at TransPacific Parkway where it intersects with US 101. Specifically, the increase in expected vehicle trips heading eastbound along TransPacific Parkway are expected to result in an increase in queue lengths approaching US 101. An increase in queue lengths corresponds to an increase in vehicle delay. As delays increase typical drivers will begin to accept smaller gaps in traffic which can result in an increase in crashes. To mitigate this potential safety concern, it is proposed that TransPacific Parkway be widened to include separate lanes for vehicles turning left (northbound) and right (southbound) onto US 101. As a result of this improvement, visitors leaving private and public facilities accessed via TransPacific Parkway will experience a safer, more convenient transition as they head east on TransPacific Parkway and then onto US 101. Visitors traveling to private and public facilities via TransPacific Parkway would be unaffected by the lane widening as traffic flow would be maintained as it is currently. For these reasons, no adverse impacts to private and public facilities resulting from construction traffic at TransPacific Parkway are expected, and in fact, road improvements would benefit visitors as they left public and private facilities along the North Spit.

As demonstrated in Appendix U-4, the SDPP Traffic Impact Analysis memorandum, regular SDPP operations are expected to require about 45-90 employees daily while the construction of the SDPP is expected to require about 500 workers daily at the peak of construction in the summer of 2018. The impacts associated with construction far outweigh the impacts associated with regular plant operations (i.e. the number of operations employees are less than two-tenths of the construction employees), and because there are no mitigations required for the impacts associated with construction, there will be no mitigations nor adverse impacts to traffic on US 101 or the TransPacific Parkway during the operations phase . Other identified public and private facilities, are located at a great enough distance from the US 101/TransPacific Parkway intersection as to be unaffected by construction or operational traffic flows related to the SDPP. Therefore, increased traffic resulting from SDPP construction or operations will not result in significant impacts to public or private facilities.

3.10 AIR TRANSPORTATION SERVICES

The Southwest Oregon Regional Airport (SORA) is located in North Bend, approximately one mile south of the SDPP (refer to Figure C-1). The SORA is operated by the Coos County Airport District as a public-use facility and has commercial, corporate, and general aviation services, as well as related support facilities (e.g., ground transportation, aircraft re-fueling, travel agents, a small business development center). The FAA issued Determinations of No Hazard in response to the 7460-Forms, Notices of Proposed Construction which the Applicant submitted to the FAA. The Notices of Proposed Construction and FAA No Hazard Determinations are attached to Exhibit E, Appendix E-6 and E-7, respectively.

3.10.1 Construction

The applicant has submitted the required Notices of Proposed Construction or Alteration (form 7460-1) to the Federal Aviation Administration (FAA) in 2013 for the proposed SDPP. In addition, the notices were submitted to the Oregon Department of Aviation. These notices included the structures for the SDPP as well as the transmission line along the utility corridor. Submittal of these forms allows the FAA to evaluate the effect of the construction on operating procedures, determine any potential hazards to air navigation, chart new objects (in this case the SDPP and transmission line structures), and determine appropriate mitigation measures. The FAA would also issue Notices to Airmen (NOTAM) and revise the Airman’s Information Manual advising of safe distances from the SDPP and the JCEP, as a whole. The SDPP will be charted; no additional marking or lighting is required by the FAA as stated in the No Hazard Determinations. As stated above, the FAA issued No Hazard Determinations in response to the 7460 Forms.

3.10.2 Operation

Air-cooled condensers to be employed at the SDPP will not create vapor plumes, but they will create a thermal plume. The FAA currently has guidance encouraging pilots to exercise caution when flying in the vicinity of potential sources of thermal plumes (e.g., power plants, industrial production facilities, and other industrial operations). There are currently no regulations concerning thermal plumes. The Applicant has further researched thermal plumes and the results of the investigation are attached as Appendix U-6. The results of the study confirm the FAA guidance for pilots to fly upwind of possible thermal plumes in order to avoid the potential for the high temperature thermal exhausts to cause air turbulence around the aircraft. Specifically, in the airspace directly above the SDPP there exists the possibility of exceeding the Australian Civil Aviation Safety Authority (CASA) thresholds such that pilots should avoid flight in the vicinity of those plumes.

4.0 EVIDENCE THAT ADVERSE IMPACTS ARE UNLIKELY TO BE SIGNIFICANT

OAR 345-021-0010(1)(u)(D). *Evidence that adverse impacts described in (C) are not likely to be significant, taking into account any measures the applicant proposes to avoid, reduce or otherwise mitigate the impacts.*

4.1 EVIDENCE REGARDING ADVERSE IMPACTS

Limited in-migration is expected to occur as a result of the construction or operation of the proposed facility. It is expected that residents from the local communities would fill some of the estimated 45 full-time jobs. The proposed facility is not expected to result in significant long-term population increases.

4.2 SEWAGE COLLECTION AND TREATMENT

As discussed in response to OAR 345-021-0010(1)(u)(C), above, during construction, sanitary wastewaters will be collected onsite in portable toilets. These units will be privately contracted and will not present a significant adverse impact to local wastewater treatment facilities.

During operations, an onsite wastewater treatment system will treat sanitary wastewaters prior to its discharge to the Industrial Wastewater Pipeline (IWP). The anticipated wastewater flow (between 2 and 3 gallons per minute) would be an insignificant addition to the IWP and would not adversely affect the pipeline capacity. It is also expected that many permanent employees would be hired from the local area. Therefore, the facility employees would neither measurably increase the local population nor increase demand on local sewage collection and treatment systems.

4.3 INDUSTRIAL WASTEWATER

Industrial wastewaters will either be discharged through the Industrial Wastewater system, which has an estimated capacity of 3.6 to 4.0 million gallons per day (gpd) (see Appendix V-1, a letter from the Port to the JCEP) or contained in on-site tanks or truck mounted tanks and transported to a wastewater disposal firm. The Applicant estimates that the average daily wastewater discharge from the SDPP will be approximately 338,400 gpd, which is significantly less than the capacity of the wastewater system. Depending on the final characterization of the wastewater's chemical properties these volumes will be sent off-site for treatment, storage, and or disposal. Both the City of Coos Bay and the City of North Bend maintain approved wastewater treatment plants that could accept this wastewater. In addition, PPV Inc., a wastewater treatment facility in Portland, Oregon, has more than adequate capacity to accept JCEP's anticipated wastewater. A written confirmation statement is provided in Appendix O-5, which confirms PPV Inc.'s ability to receive wastewater from the SDPP. Therefore no significant adverse impact to the industrial wastewater system are anticipated.

4.4 WATER SUPPLY - PROCESS AND COOLING WATER AND DOMESTIC WATER SUPPLY

Water would be provided by the CBNBWB, utilizing an existing water supply system formerly used by the closed containerboard facility. Construction uses will mainly be equipment or system flushing, chemical cleaning, steam blows, and dust control over the 39 month construction period. The CBNBWB previously supplied the containerboard mill and has the capacity to provide the requested 717 gpm at a pressure of 40 pounds per square inch for the SDPP operations (see Appendix O-1, a letter from the CBNWB).

Dry, air-cooled condenser cooling will not require a continuous supply of cooling water. Periodic supplements may be required during maintenance. Water will be used for potable/service water, power augmentation, the NOx emissions control (injection) system, and steam cycle makeup, as well as occasional combustion turbine cleaning.

The CBNBWB has reported that there is excess unused water supply capacity within the CBNBWB system and that they can install additional water lines to support the SDPP without impacting other uses. The SDPP is not expected to adversely impact the CBNCWB water supply system.

4.5 STORM WATER

Storm water run-off during construction and operation would be managed onsite in accordance with National Pollutant Discharge Elimination System (NPDES) Storm water Discharge Permits and required storm water pollution prevention plans.

Only storm water that contacts hydrocarbons (or has the potential to contact hydrocarbons) will be routed through an oil/water separator and sent to the Port's Industrial Wastewater Pipeline which has the capacity to handle from 3.6 to 4 million gpd. Other storm water will be treated onsite in the infiltration pond, vegetated swales, or through biofilters and allowed to infiltrate or evaporate, and will not be discharged to the Port's wastewater pipeline. No significant adverse effects are expected during construction or operation of the facility.

4.6 SOLID WASTE

4.6.1 Construction

Construction wastes from the proposed energy facility would mainly consist of pallets, wood packing, steel banding, steel cutoffs, cardboard packing, wood cutoffs, concrete waste, and office refuse. Waste will be minimized and recycled to the maximum extent practicable at the site. Therefore, without a significant permanent population and a limited construction period, the proposed energy facility would not compromise the capacity of the solid waste handling facilities in the area. Debris that meets the landfill disposal requirements would be transported to the Dry Creek Landfill or other permitted landfills. Recyclable materials will be segregated and transported to acceptable sites for recycling. Construction is not expected to have any impact on local community recycling or disposal capacities, because only about five tons of waste will be disposed monthly.

4.6.2 Operation

Approved recyclable materials will be segregated for pick-up or transported to approved recycling sites. Non-hazardous, non-recyclable, solid waste will be transported to the Dry Creek Landfill site, or other suitable permitted landfills. It is estimated that 10-tons of non-hazardous wastes will be produced per year.

The SDPP facility is expected to be either a SQG or a CESQG of hazardous waste, which will be transported and disposed offsite at an approved hazardous waste facility. Such wastes will represent an insignificant quantity of waste received at the permitted commercial hazardous waste disposal facilities.

No significant adverse impacts are expected because of the small volume of waste that would be generated as a result of the SDPP operations.

4.7 POLICE AND FIRE

The proposed SDPP would place an insignificant additional demand on local police services. The new facility would be fenced within an industrial area with a gated entrance and would operate 24 hours a day with personnel on site at all times, thereby minimizing opportunities for theft and vandalism. The fact that many of the construction workers are likely to live in the area already is expected to provide stability that would not result in a significant increase in calls for law enforcement during the construction period.

The proposed SDPP would be constructed with hydrants, in addition to sprinkler and deluge systems. Facility employees would be trained in emergency response and first aid procedures. The proposed SDPP facility would provide all fire protection equipment and facilities in accordance with the Oregon Fire Code.

The applicant will be establishing an emergency response station along the North Spit that will be equipped to handle situations that could occur during the construction of the SDPP. Following construction, it is unlikely that additional resources will be required that would degrade the level of service provided in Coos Bay, North Bend or Coos County.

The construction or operation of the SDPP would not significantly impact the existing Coos Bay or North Bend Fire Department’s abilities to provide service to the community.

Table U-10. Summary of Police and Fire Services

Service	Provider	Staffing	Services
Police	Coos County Sheriff's Department	Sheriff (elected official), patrol officers, communications center, and dispatch	Law enforcement services to the county, security for the court system, serving legal documents for the courts, assists with training local agencies.
	North Bend Police Department	Includes Patrol Division (11 personnel), Detective Division, K-9 Unit, plus Dispatch and Communications Divisions	Mutual Aid/Primary response
	Coos Bay Police Department	Chief of Police, 2 Captains, 3 Detectives, 4 Patrol Sergeants, 12 Officers, 1 Traffic Enforcement Officer, 1 School Resource Officer. Non-sworn staff and volunteers used in the Communications Division, which operates the 911 system.	Mutual Aid/Primary response
Fire	Coos County Emergency Dispatch for Rural Fire Protection District	Utilizes Sheriff Office with regular officers, reserve personnel, and trained volunteers.	Control and coordination of search and rescue during major emergency or disaster.
	North Bend Fire Department	11 paid firefighters (including chief, captain, three lieutenants and firefighters, and 32 volunteer firefighters.	Mutual Aid/Primary response
	Coos Bay Fire Department	16 paid firefighters (including chief captain and lieutenants) and 15 volunteer firefighters	Mutual Aid/Primary response
	Hauser Rural Fire Protection District	All volunteer, 14 first responders, 1 paramedic, and 4 EMTs.	Augment communities, providing search and rescue and emergency response following major disasters.

4.8 EDUCATION

4.8.1 Construction

Since the anticipated duration of most construction staff is unlikely to exceed 12 months, the workforce population is not expected to include many families. Therefore, temporary increases in the analysis area population due to construction workers' families living in the 39 months' expected construction schedule are likely to be negligible. However, if trends reverse themselves and the influx of construction workers result in some families moving to the area, findings about the existing capacities in the area school districts illustrate that each District has available capacity for the school children of construction workers.

4.8.2 Operation

As the proposed energy facility would only require approximately 45 full time employees, many expected to be hired from the local community, no significant numbers of new households would be created. Therefore, there would be no significant increase in the student population. In addition, the Coos Bay and North Bend school districts and other districts in Coos County are operating either within or well under capacities. Therefore, even if employees with school-age children were hired from outside the area, this would not adversely impact the education systems in the analysis area.

4.9 HEALTH CARE

For information regarding hospitals in the vicinity of the proposed facility, see the response to OAR 345-021-0010(1)(u)(B) above. As noted, during the peak of construction, approximately 200 to 300 out-of-town workers are anticipated, with many returning home on weekends. Due to the short duration of most construction assignments (less than 12 months), few workers are expected to relocate their families to Coos Bay/North Bend during construction. During operation, approximately 45 full-time positions are anticipated. Based on the above, significant adverse impacts are not expected during construction or operation of the SDPP.

4.10 HOUSING

4.10.1 Construction

It is estimated that the average construction work force of 500 personnel would be at the SDPP site during the 39-month construction period, with approximately 40 to 60 percent of the workers to be hired locally, creating no housing issues for these workers. Since the average worker would be on site for less than 12 months, it is unlikely that they would seek permanent dwelling accommodations, but would take up many of the temporary housing opportunities within the commuting distance of the SDPP site. In addition, the Applicant is anticipating being able to accommodate up to 2,100 workers at the temporary housing facility in North Bend. Analysis of the labor supply, also suggests that workers would come from the surrounding area, commuting home to Willamette Valley areas during the weekends. By commuting home on weekends, they would free-up places for overnight stays by tourists (Whelan, 2006; Appendix U-5).

4.10.2 Operation

The demand for permanent housing in the analysis area is not anticipated to increase significantly because the proposed generating project would require few full-time employees. It is expected that many of these employees would be hired from the local community.

Both historic and recent vacancy rates were examined using US Census figures as well as those from the Bay Area Chamber of Commerce. As shown in Table U-9, there were approximately 30,593 housing units in Coos County, with 3,977 vacancies (13 percent). The current vacancy rate in Coos Bay and North Bend is 6 percent, which represents 707 vacancies (7,325 housing units in Coos Bay and 4,450 in North Bend) within these two communities alone[30].

Given the substantial vacancies in housing, significant adverse impacts are not anticipated. The local communities of Coos Bay and North Bend, as well as other areas of Coos County, would be able to adequately provide housing for both construction and permanent workers.

4.11 TRAFFIC

A Traffic Impact Analysis was performed to identify the potential effects of the SDPP on traffic operations and roadway facilities in the study area. The analysis focused on seven intersections that are expected to be affected by construction traffic, with three intersections along US 101 and four on the TransPacific Parkway (DEA, 2014; Appendix U-4). Analyses of traffic impacts during operation of the SDPP were also considered.

The analysis evaluated both existing and future background traffic operations, including an analysis of the peak use period in the summer month of August, when recreational traffic conditions are expected to coincide with the peak of SDPP construction. The analysis concluded that construction of the SDPP would have little to no operational degradation at any of the study area intersections. In lieu of proposed operation mitigation strategies, the report proposes a voluntary operational improvement to improve safety at the intersection of Transpacific Parkway and US 101. The proposed mitigation would widen Transpacific Parkway to provide dedicated left- and right-turn lanes onto US 101 with the purpose of providing storage for turning vehicles and trucks, allowing drivers to wait for acceptable gaps along US 101 when turning on to mainline traffic (DEA, 2014; Appendix U-4).

4.12 AIR TRANSPORTATION SERVICES

4.12.1 Construction

The Project has filed Notices of Construction or Alteration required by the FAA for the permanent structures associated with the SDPP and transmission line structures and received Determinations of No Hazard in response from the FAA. Further, the FAA stated that no mitigation measures such as lighting or marking are required.

[30] Bay Area Chamber of Commerce, Ibid

4.12.2 Operation

Review of the SORA website indicates that pilots using the SORA are already advised that there is a shipping channel within 1000 feet of the end of one runway or two-thirds of a mile of the other runway and that vessels within the channel may have masts of 140 feet. Pilots are required to assume that vessels could be within the channel at any time. Vessels would pose a more substantial hazard to the SORA than the SDPP. The SDPP is unlikely to pose a significant adverse impact to the SORA.

Within the EFSC Site Boundary for the SDPP there are no structures above the 167.1 foot elevation that defines the protected air space around the SORA above the location of the SDPP. There are structures associated with the Gas Conditioning Facility, Figure B-1, Sheet 2 that do penetrate the 167.1 foot elevation. However, these structures are outside the EFSC boundary and are not within EFSC jurisdiction. All structures have be reported to the FAA with appropriate locations and elevations.

Although the FAA currently does not have any guidelines for conducting thermal plume assessments, they are conducting studies to further characterize the effects of thermal plumes. The Applicant has conducted its own study regarding thermal plumes which is attached as Appendix U-6 Thermal Plume Study. The results indicate potential for thermal plumes to affect airspace primarily in the area directly above the SDPP's exhausts and that pilots should adhere to the FAA guidance which recommends that pilots fly upwind of possible thermal plumes in order to avoid air turbulence caused by the thermal exhaust.

5.0 MONITORING PROGRAMS

OAR 345-021-0010(1)(u)(E). *The applicant's proposed monitoring program, if any, for impacts to the ability of the providers identified in (B) to provide the services listed in OAR 345-022-0110.*

As stated in the Traffic Impact Analysis, it will be the sole responsibility of the Oregon Department of Transportation (ODOT) to monitor the transportation impacts during the construction of the project. Because US 101 is a state highway, ODOT already monitors traffic operations on US 101, so there is no additional burden on ODOT.[31] However, if, during the project, significant transportation issues arise, a representative from Jordan Cove Energy Project, L.P. shall convene to resolve the issue.

Because the traffic impact analysis concluded that construction of the SDPP would have little to no operational degradation at any of the study area intersections, no applicant imposed monitoring programs are proposed (DEA, 2014; Appendix U-4).

[31] There is a traffic camera on US 101 on the north end of McCullough Bridge that ODOT can pan around and see both north and south on US 101. This camera is always on and someone is always monitoring it. https://www.tripcheck.com/Pages/RCMap.asp?curRegion=4

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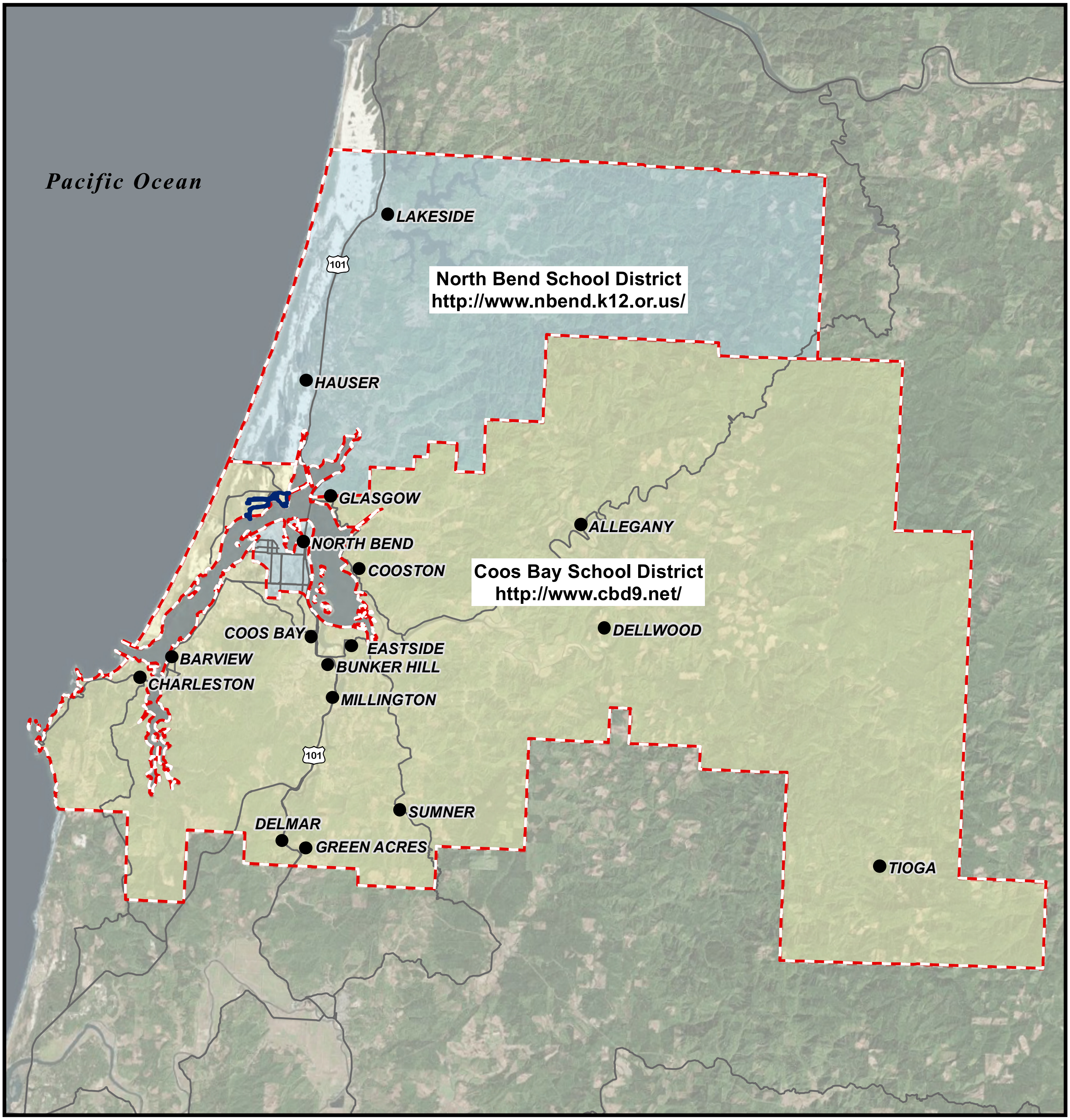
Figure U-1. School District Boundaries



N

0 2.5 5 Miles

1 inch = 4.8 miles

EFSC Site Boundary

Coos Bay School District Boundary

North Bend School District Boundary

City or Town in Coos Bay or North Bend School District

Data Sources: Oregon Geospatial Data Clearinghouse

South Dunes Power Plant Project

EFSC Application

EXHIBIT U

Figure U-1

School District Boundaries

Date: 10/13/2014
Reviewed By MM
Designed By SAST

APPENDIX U-1

Disposal Facility Capacity Confirmation Statements

Jennifer M. Mills

From: Lee Fortier <lfortier@roguedisposal.com>
Sent: Wednesday, September 10, 2014 1:58 PM
To: Jennifer M. Mills
Subject: RE: Dry Creek Landfill

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Jen,

The purpose of this email is to confirm that Dry Creek Landfill's Department of Environmental Quality permitted capacity is approximately 70,000,000 tons of solid waste. As of December 31, 2013, Dry Creek Landfill had accepted 4,487,600 tons of solid waste, leaving a capacity of 65,512,400 tons. The facility accepted approximately 1,100 tons per day in 2013 (approximately 340,000 tons per year). Therefore, DCL has well in excess of 100 years of remaining capacity.

Thanks, Lee

Lee Fortier, P.E.
General Manager
Dry Creek Landfill
Office: 541-494-5411
Cell: 541-210-6223
FAX: 541-830-8387

From: Jennifer M. Mills [mailto:jmills@farallonconsulting.com]
Sent: Wednesday, September 10, 2014 1:42 PM
To: Lee Fortier
Subject: RE: Dry Creek Landfill

Hello Lee,

Thank you for returning my call today regarding solid waste disposal for the proposed South Dunes Power Plant (SDP), which is currently undergoing an application process through the Oregon Department of Energy (ODOE). As I mentioned, the Dry Creek Landfill was identified as a potential solid waste disposal facility and we need written confirmation from the Dry Creek Landfill to include in the project application. Specifically, we need a document (email or short letter) stating that your facility is available for non-hazardous solid waste and has adequate capacity to accept SDP hazardous waste in the quantities estimated below.

SDP non-hazardous solid wastes generated during construction activities are expected to include domestic refuse, office waste, packaging materials, steel cut-offs, and construction materials consisting of waste steel, other waste metals, and normal miscellaneous construction debris consisting of wood, concrete, and other refuse (estimated 5 tons per month for ~ 36 months). During facility operation, approximately 10 tons of refuse are expected per year, primarily consisting of office and maintenance waste.

Thank you very much for your assistance and please feel free to contact me with any questions you may have.

Kind Regards,

Jen

Jennifer Mills, Project Environmental Scientist
Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
jmills@farallonconsulting.com | Direct: (509) 280-4632 | Cell: (971) 373-0350

Jennifer M. Mills

From: Castner, Kristin <kcastner@wm.com>
Sent: Friday, September 12, 2014 9:31 AM
To: Jennifer M. Mills
Subject: Columbia Ridge Capacity

Columbia Ridge has estimated capacity of 143 years of life remaining for the Columbia Ridge Landfill and Recycling Center (CRLRC).

Kristin Castner
Waste Approvals Manager - PNW, Hawaii, Alaska
kcastner@wm.com

Waste Management
7227 NE 55th Avenue
Portland, Oregon 97218
Tel 503 493 7834
Cell 503 519 3997

SDP non-hazardous solid wastes generated during construction activities are expected to include domestic refuse, office waste, packaging materials, steel cut-offs, and construction materials consisting of waste steel, other waste metals, and normal miscellaneous construction debris consisting of wood, concrete, and other refuse (estimated 5 tons per month for ~ 36 months). During facility operation, approximately 10 tons of refuse are expected per year, primarily consisting of office and maintenance waste.

Thank you very much for your assistance and please feel free to contact me with any questions you may have.

Kind Regards,
Jen

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Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
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Jennifer M. Mills

From: Macnab, Ian <IMacnab@republicservices.com>
Sent: Friday, October 03, 2014 10:04 AM
To: Jennifer M. Mills
Subject: RE: Republic Services Capacity Confirmation Request

Jen,

Coffin Butte landfill currently has 40+ years of capacity remaining and is permitted to accept non-hazardous solid waste. The site has the capacity to accept the volumes mentioned in your email below. Let me know if you need any additional information.

Ian Macnab | Environmental Manager | Oregon
Office 541-745-5792 ext. 17 **Cell** 541-230-4022 **Email** imacnab@republicservices.com

---

From: Jennifer M. Mills [mailto:jmills@farallonconsulting.com]
Sent: Friday, October 03, 2014 9:54 AM
To: Macnab, Ian
Subject: Republic Services Capacity Confirmation Request

Hello Ian,

As I mentioned, Republic Services was identified as a potential solid waste disposal facility for the South Dunes Power Plant (SDPP) and we need written confirmation from your facility to include in the project application. Specifically, we need a document (email or short letter) stating that your facility is available for non-hazardous solid waste and has adequate capacity to accept the SDPP non-hazardous waste in the quantities estimated below.

SDPP non-hazardous solid wastes generated during construction activities are expected to include domestic refuse, office waste, packaging materials, steel cut-offs, and construction materials consisting of waste steel, other waste metals, and normal miscellaneous construction debris consisting of wood, concrete, and other refuse (estimated 5 tons per month for ~ 36 months). During facility operation, approximately 10 tons of refuse are expected per year, primarily consisting of office and maintenance waste.

Thank you very much for your assistance and please feel free to contact me with any questions you may have.

Kind Regards,
Jen

Jennifer Mills, Project Environmental Scientist
Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
jmills@farallonconsulting.com | Direct: (503) 280-4632 | Cell: (971) 373-0350

Jennifer M. Mills

From: Anderson, Charles <cander21@wm.com>
Sent: Thursday, September 11, 2014 4:23 PM
To: Jennifer M. Mills
Cc: Castner, Kristin
Subject: RE: Request for Capacity Confirmation

Jennifer,

As per your recent inquiry related to Chemical Waste Management of the Northwest (CWM). CWM operates a subtitle C landfill in Eastern Oregon, which has a permitted site life of 30 plus years remaining. The site receives various forms of hazardous waste for treatment, landfill, and off site shipment.

Please note, each waste type must undergo a profile process prior to acceptance.

Charles "Alan" Anderson
District Manager
Chemical Waste Management of the Northwest
Office: 541 454 3209
Cander21@wm.com

From: Jennifer M. Mills [mailto:jmills@farallonconsulting.com]
Sent: Tuesday, September 09, 2014 4:52 PM
To: Anderson, Charles
Subject: RE: Request for Capacity Confirmation

I also wanted to mention that we currently don't have estimated quantities of hazardous waste generation. I'm trying to track this information down but I'm not sure if estimates are available at this time. If not, perhaps WM could include a "not to exceed" or "up to" quantity or in their statement? Feel free to call me if you'd like to discuss and I'll keep you posted if I find any specific quantity information on my end.

Thanks!

Jennifer Mills, Project Environmental Scientist
Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
jmills@farallonconsulting.com | Direct: (509) 280-4632 | Cell: (971) 373-0350

From: Jennifer M. Mills
Sent: Tuesday, September 09, 2014 4:03 PM
To: 'cander21@wm.com'
Subject: Request for Capacity Confirmation

Hello Allan,

Thank you for taking my call today regarding hazardous waste disposal for the proposed South Dunes Power Plant (SDP), which is currently undergoing an application process through the Oregon Department of Energy (ODOE). As I mentioned, WM was identified as a potential hazardous waste disposal facility but we need written confirmation from WM to include in the project application. Specifically, we need a document (email or short letter) stating that WM has adequate capacity to accept SDP hazardous waste. SDP hazardous wastes are expected to include:

- oily rags
- equipment and vehicle maintenance solvents
- waste oils, greases and lubricants
- waste water containing cleaning chemicals (hot water flushes to remove debris, sand, and dirt; hot alkaline flushes including degreasing agents such as sodium phosphate or a synthetic detergent to remove oils and greases; and acids or chelants including foam inhibitor and wetting agent, inhibited citric acid, EDTA, sodium carbonate, and sodium nitrate to remove mill scale and corrosion products from piping system)
- water treatment chemicals (sodium hypochlorite, filter aid, sodium hydroxide, sodium bisulfate, sodium phosphate, proprietary scale inhibitors, 19% aqueous ammonia)
- compressed gasses (carbon dioxide, oxygen, hydrogen, nitrogen oxide, and welding gasses, such as acetylene)
- universal wastes (lamps, batteries, mercury containing thermostats or equipment, and unused pesticides)

Thank you very much for your assistance and please feel free to contact me with any questions you may have.

Kind Regards,
Jen

Jennifer Mills, Project Environmental Scientist
Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
jmills@farallonconsulting.com | Direct: (503) 280-4632 | Cell: (971) 373-0350

Jennifer M. Mills

From: Jim Hancock <jim.hancock@usecology.com>
Sent: Monday, September 15, 2014 6:55 AM
To: Jennifer M. Mills
Subject: RE: Request for Capacity Confirmation

Jennifer,
sorry for the lateness of my response.

Please consider this as a official response to your enquiry:

SDP hazardous wastes are expected to include:

- oily rags- Acceptable at USEI
- equipment and vehicle maintenance solvents- Acceptable at USEI for storage and offsite solvent recycling
- waste oils, greases and lubricants- Acceptable at USEI
- waste water containing cleaning chemicals (hot water flushes to remove debris, sand, and dirt; hot alkaline flushes including degreasing agents such as sodium phosphate or a synthetic detergent to remove oils and greases; and acids or chelants including foam inhibitor and wetting agent, inhibited citric acid, EDTA, sodium carbonate, and sodium nitrate to remove mill scale and corrosion products from piping system)- Acceptable at USEI
- water treatment chemicals (sodium hypochlorite, filter aid, sodium hydroxide, sodium bisulfate, sodium phosphate, proprietary scale inhibitors, 19% aqueous ammonia) – Acceptable at USEI
- compressed gasses (carbon dioxide, oxygen, hydrogen, nitrogen oxide, and welding gasses, such as acetylene)- Acceptable at USEI for storage and shipment to an appropriate treatment facility
- universal wastes (lamps, batteries, mercury containing thermostats or equipment, and unused pesticides)- Acceptable at USEI for storage and or treatment on a waste stream by waste stream basis.

USEI is a RCRA subtitle C TSDF. USEI is also permitted to accept NORM and TNORM. The information above assumes an approved profile. USEI's forms and customer audit check list is available at- http://www.americanecology.com/idaho_documents_forms.htm

Should you have any questions concerning the information above please call me to discuss.

Jim Hancock/ USEI QA Manager
REMEMBER: SAFETY IS EVERY STEP

USEcologyIdaho
20400 Lemley Road
P.O. Box 400
Grand View, Idaho, 83647
(office)208.834.2275 EXT. 2318
jim.hancock@usecology.com

From: Jennifer M. Mills [mailto:jmills@farallonconsulting.com]
Sent: Wednesday, September 10, 2014 3:32 PM
To: Jim Hancock
Subject: RE: Request for Capacity Confirmation

If you could get it to me by the end of the week that would be great.

Jennifer Mills, Project Environmental Scientist
Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
jmills@farallonconsulting.com | Direct: (509) 280-4632 | Cell: (971) 373-0350

From: Jim Hancock [mailto:jim.hancock@usecology.com]
Sent: Wednesday, September 10, 2014 2:32 PM
To: Jennifer M. Mills
Subject: RE: Request for Capacity Confirmation

Jennifer;

Thank you. Are you working on a short timeline or do we have a few days to get this back to you?

Regards;

Jim Hancock/ USEI QA Manager
REMEMBER: SAFETY IS EVERY STEP

USEcologyIdaho
20400 Lemley Road
P.O. Box 400
Grand View, Idaho, 83647
(office)208.834.2275 EXT. 2318
jim.hancock@usecology.com

From: Jennifer M. Mills [mailto:jmills@farallonconsulting.com]
Sent: Wednesday, September 10, 2014 3:25 PM
To: Jim Hancock
Subject: Request for Capacity Confirmation

Hello Jim,

Thank you for taking my call today regarding hazardous waste disposal for the proposed South Dunes Power Plant (SDP), which is currently undergoing an application process through the Oregon Department of Energy (ODOE). As I mentioned, US Ecology was identified as a potential hazardous waste disposal facility and we need written confirmation from US Ecology to include in the project application. Specifically, we need a document (email or short letter) stating that your facility has adequate capacity to accept SDP hazardous waste, as specified below.

SDP hazardous wastes are expected to include:

- oily rags
- equipment and vehicle maintenance solvents
- waste oils, greases and lubricants
- waste water containing cleaning chemicals (hot water flushes to remove debris, sand, and dirt; hot alkaline flushes including degreasing agents such as sodium phosphate or a synthetic detergent to remove oils and greases; and acids or chelants including foam inhibitor and wetting agent, inhibited citric acid, EDTA, sodium carbonate, and sodium nitrate to remove mill scale and corrosion products from piping system)
- water treatment chemicals (sodium hypochlorite, filter aid, sodium hydroxide, sodium bisulfate, sodium phosphate, proprietary scale inhibitors, 19% aqueous ammonia)
- compressed gasses (carbon dioxide, oxygen, hydrogen, nitrogen oxide, and welding gasses, such as acetylene)
- universal wastes (lamps, batteries, mercury containing thermostats or equipment, and unused pesticides)

We do not have estimates for the quantities of each type of hazardous waste stream at this time; however, the SDP is expected to be registered as either a Conditionally Exempt Small Quantity Generator (CESQG) (generating 100 kilograms (kg) or less per month of hazardous waste or 1 kg or less of acutely hazardous waste per month) or Small-Quantity Generator (SQG) (generating less than 1000 kg of hazardous waste per month) during both facility construction and operation.

Thank you very much for your assistance and please feel free to contact me with any questions you may have.

Kind Regards,
Jen

Jennifer Mills, Project Environmental Scientist
Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
jmills@farallonconsulting.com | Direct: (503) 280-4632 | Cell: (971) 373-0350

Celebrating 15 Years of Quality Service and Announcing New Web Site
Please consider the environment before printing this e-mail.

Jennifer M. Mills

From: Scales, Melissa D <scalesm@cleanharbors.com>
Sent: Friday, September 19, 2014 11:35 AM
To: Jennifer M. Mills
Subject: Waste Disposal Needs - South Dunes Power Plant

Follow Up Flag: Follow up
Flag Status: Flagged

Jennifer

As per your recent inquiry regarding hazardous waste disposal for the South Dunes Power Plant, Clean Harbors operates a hazardous waste incinerator located at Aragonite, Utah that has adequate capacity to receive waste for the site as described. Acceptance of this waste would be contingent upon approval of a waste profile based on characterization of the waste generated.

Thank you for thinking of Clean Harbors for your waste disposal needs and please feel free to contact me with any questions and / or concerns.

Safety Starts with Me: Live It 3-6-5

Lissa Scales
Manager, Operations
Clean Harbors
(o) 435.884.8174
(c) 801.230.5401
scalesm@cleanharbors.com
www.cleanharbors.com

APPENDIX U-2

Hospital Capacity Confirmation Statements

From:	Adelman, Todd
To:	Jennifer M. Mills
Cc:	Laskey, Dina; Quinlan, Jessica; Baxter, Amy; Fortune, David
Subject:	RE: Licensed Beds
Date:	Tuesday, October 14, 2014 10:01:32 AM

Ms. Mills,

1. Licensed capacity: 172 beds
2. ED/Inpatient capacity for increased construction workers: Adequate
3. Surge capacity: Gatekeeper 2 tent. Small, but FEMA certified decon team, with tent. Decon shower. Surge plan includes utilization of CERT and Medical Reserve Corps and perimeter triage stations.
4. Jordan Cove detailed an MOU with the state to provide funding for training, supplies and response, but we have not seen or signed it yet.

You are welcomed to call me anytime if you need any other details.

Thanks.

tj

Todd J. Adelman, RN, CEN
QPI Project Manager & Certified Cardiovascular Care Coordinator
Emergency Preparedness Program Manager
Bay Area Hospital, Coos Bay, Oregon
(541) 999-9799

From: Laskey, Dina
Sent: Tuesday, October 14, 2014 09:48
To: Adelman, Todd
Subject: FW: Licensed Beds

Hi Todd,
Could you help to answer this question for me?

Thanks.

Dina Laskey
Executive Assistant
Bay Area Hospital
1775 Thompson Road
Coos Bay, OR 97420
Phone: 541-269-8135
Fax: 541-267-7057

From: Jennifer M. Mills [mailto:jmills@farallonconsulting.com]
Sent: Friday, October 03, 2014 12:19 PM
To: Laskey, Dina
Subject: RE: Licensed Beds

Hello Dina,

Thank you for the information you provided below. I wanted to see if you could provide any additional information regarding the hospital's capacity. Given the hospital's current number of beds and existing patient load, does the hospital currently have adequate capacity for the potential of increased patients during construction or operation of the South Dunes Power Plant? Also, does the hospital have any additional emergency capacity in the case of a natural disaster or catastrophic event (i.e. temporary tent triage)?

Thank you in advance for any additional information you can provide.

Thank you,
Jen

Jennifer Mills, Project Environmental Scientist
Farallon Consulting, L.L.C. | 4380 SW Macadam, Suite 500 | Portland, Oregon 97239
jmills@farallonconsulting.com | Direct: (503) 280-4632 | Cell: (971) 373-0350

From: Laskey, Dina [mailto:Dina.Laskey@bayareahospital.org]
Sent: Thursday, October 02, 2014 11:34 AM
To: Jennifer M. Mills
Subject: Licensed Beds

Hi,
We are licensed for 172 beds and we can adequately staff approximately 130 beds at this time.

If you have any other questions, please let me know.

Thank you!

Dina Laskey
Executive Assistant
Bay Area Hospital
1775 Thompson Road
Coos Bay, OR 97420
Phone: 541-269-8135
Fax: 541-267-7057

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Jennifer M. Mills

From: Kimberly Russell <KRussell@southerncoos.org>
Sent: Thursday, October 02, 2014 2:33 PM
To: Jennifer M. Mills
Subject: FW: Southern Coos Hospital info

Southern Coos Hospital and Health Center is a rural hospital owned and operated by the Southern Coos Health District in Bandon, Oregon. Currently licensed for 21 beds, and presently staffed to accommodate 16 beds. The hospital was granted Critical Access Hospital status in November of 2000 while maintaining its designation as a full-service, general acute hospital.

The hospital nursing services include a four-station emergency department, surgical services, endoscopic services, an outpatient department, and a swing-bed program. These are supported by a full-service laboratory; a respiratory therapy department; medical imaging services including CT, ultrasound, general radiography and a certified mammography program and we are compliant with state and federal disaster preparedness regulations.

The hospital serves Southern Coos County and Northern Curry County. This primary service area is populated by about 10,000 residents who increasingly look to Southern Coos Hospital and Health Center for their healthcare. The local community presently has three primary physician practices. The hospital augments these practices through Outpatient Services, Inpatient Care, and a specialty clinic located adjacent to the hospital. We are presently beginning construction on a new primary care clinic on our campus with two staff physicians now working out of temporary offices until the projected February 1 opening of the new facility.

Kim Russell
Executive Secretary/Administration
Southern Coos Hospital & Health Center
900 11th St. SE
Bandon, OR 97411
(541) 329-1031
(541) 347-0507 – fax
krussell@southerncoos.org
www.southerncoos.org

Jennifer M. Mills

From: Beth Heatongrindel <bethh@cvhospital.org>
Sent: Friday, October 03, 2014 11:12 AM
To: Jennifer M. Mills
Cc: Dennis Zielinski
Subject: Coquille Valley Hospital

Follow Up Flag: Follow up
Flag Status: Flagged

Hello,
You asked how many beds we have available for a catastrophic event for research on the Jordan Cove Project. We have 17 beds in our new hospital and 8 beds in our former hospital for swing-bed patients (lower acuity needs) giving us a **total of 25 beds** available on a regular basis, we are licensed for 30 beds by the state. We have no immediate plans to add more beds to that number.

In the event of a natural disaster or catastrophic event we will have temporary tent triage for many more.
We are participating in the Great Shake Out of 2014 and on October 16th at 10:16am we are simulating an earthquake, were we will be setting up that 40 foot tent and going through a full disaster drill sequence with multiple practice triage patients, testing our satellite phone and firing up the generator, as well as using (after first replacing) or disaster food rations. It should be very educational.

Thank you for your interest!

Beth Heatongrindel
Administrative Assistant
Coquille Valley Hospital
541.396.1052
bethh@cvhospital.org
www.cvhospital.org

APPENDIX U-3

Public Education Capacity Confirmation Statements

From: Bill Yester
To: Jennifer M. Mills
Subject: Enrollment and Capacity
Date: Tuesday, October 14, 2014 4:38:03 PM

Our total enrollment in our buildings is 2480 students.
We have a virtual academy of 1834 students.

We have two elementary schools
Hillcrest has a capacity of 759 students with class sizes of 30
North Bay has a capacity of 797 students with class sizes of 30
North Bend Middle School has a capacity of 992 students with 31 classrooms and 32 students per class.
North Bend High School has a capacity of 1888 students with 59 classrooms and 32 students per class.

These are total net occupants potential. I would like to remind you that this is an occupant potential. I do not think we would ever allow our schools to get this big.-

If there is anything else you need let us know

Bill Yester
Superintendent

North Bend School District
1913 Meade Street
North Bend, OR 97459
byester@nbend.k12.or.us
541.751.6797

From:	Bill Yester
To:	Jennifer M. Mills
Subject:	school capacities
Date:	Friday, October 17, 2014 1:31:56 PM

I have found some better data on our school capacities done by square footage.

Hillcrest 594 students
North Bay 870 students
North Bend Middle School 992
N orth Bend HS 1500-1600

Bill Yester
Superintendent

North Bend School District
1913 Meade Street
North Bend, OR 97459
byester@nbend.k12.or.us
541.751.6797

Jennifer M. Mills

From: Rod Danielson <rodd@coos-bay.k12.or.us>
Sent: Friday, October 03, 2014 3:03 PM
To: Jennifer M. Mills
Cc: Candace McGowne
Subject: Coos Bay SD capacity

Jen Mills,

Per your request for the permitting of the Jordon Cove project, my thoughts on student capacity.

We currently have 3,131 students enrolled in our district. Currently our two elementary schools are at capacity and based on projections we are considering opening a school next year that we closed in 2011.

In addition to that building we have another school, with some capital improvements, could be put back into commission.

It would take some juggling and money to open the two buildings, but with existing facilities I estimate we could accommodate an increase of 600 – 700 students.

Rod Danielson | Business Manager
Coos Bay School District ● Phone: 541-267-1317

APPENDIX U-4

Traffic Impact Analysis for the South Dunes Power Plant in Coos Bay, Oregon dated September 22, 2014

DAVID EVANS AND ASSOCIATES INC.

MEMORANDUM

DATE: September 22, 2014

TO: Jordan Cove Energy Project, L.P.
C/O Bob Braddock

FROM: Josh Anderson, PE, PTOE

SUBJECT: **Traffic Impact Analysis for the South Dunes Power Plant in Coos Bay, Oregon**

COPIES: Sean Sullivan, David Evans and Associates, Inc.; Bob Long, Farallon Consulting, LLC; Meagan Masten, Perkins Coie, LLP; FILE

NOTE: All Figures and Appendixes are attached at the end of the memorandum.

EXECUTIVE SUMMARY

This technical memorandum summarizes the traffic-related impacts associated with the construction and operation of the South Dunes Power Plant located on the North Spit north of North Bend in Coos County Oregon.

This memorandum summarizes the transportation impacts associated with peak construction activities of the proposed project at seven study area intersections:

- US 101 at Transpacific Parkway
- US 101 at East Bay Drive
- US 101 at Ferry Road
- Transpacific Parkway at New Private Driveway (Entrance A)
- Transpacific Parkway at Jordan Cove Road (Entrance C)
- Transpacific Parkway at Horsefall Beach Road
- Transpacific Parkway at Boxcar Hill (Entrance D)

The analysis shows that all study area intersections meet the applicable operational targets in year 2014 during both weekday AM and PM peak hour conditions. The study area intersections are also expected to meet operational targets under year 2018 future background conditions.

Construction of the South Dunes Power Plant (SDPP) is expected to be completed over a 39-month period extending from January of 2016 through April of 2019. Peak construction activities are expected to occur in the summer of 2018, when the staffing level will be at approximately 500 daily employees. The peak adjacent roadway volumes are expected to occur in the summer of 2018. Traffic volumes during the majority of the 39-month construction period will be significantly lower than peak levels represented in this memorandum.

Analysis of total traffic conditions (background plus site-generated trips during construction) indicated that all seven study area intersections would meet operational targets.

The following voluntary operational improvement is planned:

- Widen Transpacific Parkway as it approaches US 101 to provide for dedicated left- and right-turn lanes onto US 101

Operations analysis was performed on the study area intersections under existing and improved roadway conditions. The analysis showed that all intersections within the study area meet the applicable roadway standards and that the above-noted voluntary operational improvement has the potential to improve traffic safety.

The recommended voluntary operational improvement will require approval of and coordination with Oregon Department of Transportation (ODOT) and Coos County. Furthermore, businesses, agencies and land owners on the North Spit should be kept apprised of the schedule and potential transportation impacts of construction activities as well as any mitigation measures that are to be implemented.

1. INTRODUCTION

This technical memorandum summarizes the traffic-related impacts associated with the construction and operation of the South Dunes Power Plant (SDPP) located on the North Spit north of North Bend in Coos County Oregon.

This TIA focuses on the traffic impacts of construction activity only. Regular SDPP operations are expected to require about 90 employees daily while the construction of the SDPP is expected to require about 500 workers daily at the peak of construction in the summer of 2018. The impacts associated with the construction would far outweigh the impacts associated with regular plant operations, and because there are no mitigations required for the impacts associated with construction, there will be no mitigations required for regular plant operations.

The analysis utilizes recent traffic counts collected in August of 2014 (which is at or near to the time when recreational traffic in the study area is typically at its highest), the most current understanding of work-based trip patterns to and from the site during the critical peak construction phase, as well as during the summer months when adjacent roadway traffic peaks.

1.1. SITE LOCATION

The proposed project is located in Coos County Oregon, just north of North Bend. Access to the site will be provided by the existing Jordan Cove Road which connects with Transpacific Parkway at two intersections north of the site. Transpacific Parkway connects with US 101 approximately 1-1/2 miles to the east. An additional emergency gated site access will be provided by a north-south roadway on the western boundary of the site. This road will connect to Transpacific Parkway west of Jordan Cove Road.

1.2. STUDY AREA

The study area encompasses the roadways that are expected to be affected by construction traffic and consists of the following seven intersections:

- US 101 at Transpacific Parkway
- US 101 at East Bay Drive

- US 101 at Ferry Road
- Transpacific Parkway at New Private Driveway (Entrance A)
- Transpacific Parkway at Jordan Cove Road (Entrance C)
- Transpacific Parkway at Horsefall Beach Road
- Transpacific Parkway at Boxcar Hill (Entrance D)

The study intersections and lane configurations are shown in **Figure 1**. NOTE: Intersections west of Boxcar Hill will not be effected by any SDPP specific trips and therefore will have no site generated volumes.

2. TRAFFIC OPERATIONS TARGETS AND PROCEDURES

Traffic operations for intersections and roadways are evaluated and compared based on two general processes: volume to capacity (v/c) ratio and level of service (LOS). Vehicle queuing at intersections is a safety concern that is also evaluated as part of the operational analysis.

The intersection operations were evaluated using the methodology outlined in the *2000 Highway Capacity Manual* (HCM). Synchro analysis software was used to generate the HCM reports from which the v/c ratios and LOS were derived. This document also presents 95th percentile queuing and movement delay results that have been generated by SimTraffic simulation software. The SimTraffic results were derived from the average of five randomly seeded simulation model runs. All Synchro and SimTraffic output sheets can be found in **Appendices C through F**.

2.1. VOLUME TO CAPACITY RATIO

Transportation engineers have established various targets for measuring traffic capacity and quality of service of roadways at intersections. A comparison of traffic volume demand to intersection capacity is one method of evaluating how well an intersection is operating. This comparison is presented as a volume to capacity (v/c) ratio. A v/c ratio of less than 1.00 indicates that the volume is less than capacity. When it is closer to 0.00, traffic conditions are generally good with little congestion and minimal delays for most intersection movements. As the v/c ratio approaches 1.00, traffic becomes more congested and unstable with longer delays.

The updated 1999 Oregon Highway Plan (OHP) (Adopted December 21, 2011) defines mobility targets (in **Table 5**) in terms of v/c ratios, which are dependent on the roadway classification and area type. According to the OHP, the mobility target for US 101, a rural Statewide Highway, is 0.70 at the intersections of Transpacific Parkway and East Bay drive. Ferry Road at US 101, however is within the City limits of North Bend and a posted speed of 35 mph; therefore, it has a target v/c ratio of 0.85. The intersections along Transpacific Parkway are governed by the Coos County operational standard of 0.85 developed in their most current Transportation System Plan.

2.2. LEVEL OF SERVICE

Another target for measuring traffic capacity and quality of service of roadways at intersections is level of service (LOS). At both stop-controlled and signalized intersections, LOS is a function of control delay, which includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Six targets have been established ranging from LOS A where there is little or no delay, to LOS F, where there is delay of more than 50 seconds at unsignalized intersections, or more than 80 seconds at signalized intersections.

It should be noted that, although delays can sometimes be long for some movements at a stop-controlled intersection, the v/c ratio may indicate that there is adequate capacity to process the demand for that movement. Similarly at signalized intersections, some movements, particularly side street approaches or left turns onto side streets, may experience longer delays because they receive only a small portion of the green time during a signal cycle but their v/c ratio may be relatively low. For these reasons it is important to examine both v/c ratio and LOS when evaluating overall intersection operations. Both are evaluated in the analyses that follow. Coos County does not have a LOS standard, and the City of North Bend uses a mobility standard of LOS D or better based on HCM compliant delay calculations.

2.3. 95TH PERCENTILE QUEUING

When congestion is present or anticipated, additional calculations of queuing are important. Excessive queues can indicate locations where a higher frequency of collisions may occur due to unexpected conditions (vehicles stopping in otherwise free-flowing travel lanes) or risky driver behaviors.

SimTraffic was used to generate the 95th percentile queue lengths. SimTraffic was used because, as a microsimulation model, SimTraffic is capable of calculating the effects of traffic flow under saturated traffic conditions where traffic may spill over from one intersection to another. Models such as Synchro are not capable of calculating the effects of saturated traffic flow conditions; therefore, the Synchro calculated queue lengths are not reported. These results are important, as they present a quantifiable measure of current congestion levels.

The model was run seven times within SimTraffic for both the AM and PM peak hour conditions in accordance with ODOT's Transportation Planning and Analysis Unit (TPAU) methodologies. The queues from each of the seven model runs were screened for outliers, then averaged together for values presented in this memorandum.

3. EXISTING CONDITIONS

The existing conditions analysis addresses the month of anticipated peak of construction activity (see additional explanation in Section 5.1) as well as the peak adjacent roadway conditions (August 2014).

3.1. TRAFFIC VOLUME DEVELOPMENT

This section describes the collection of traffic data and the methodology used to adjust existing traffic volumes to account for seasonal fluctuations in volumes experienced throughout the year and growth related to population and employment increases. Site-generated traffic will impact the transportation system during both the AM and PM peak hours; therefore, the seasonal adjustment methodologies were applied to both of these peak hour periods. The full volume development worksheets can be found in **Appendix A.**

3.1.1. TRAFFIC COUNTS

Turning movement counts were collected at the six existing study area intersections on August 12, 2014 from 2:00 PM to 6:00 PM and on August 13, 2014 from 6:00 AM to 9:00 AM. Additionally, a full 16 hours of turn movement volume data was collected at the intersections of US 101 and Transpacific Parkway and US 101 and Ferry Road on March 11, 2014 in accordance with recommended ODOT procedures. Traffic count data is provided in **Appendix B**.

3.1.2. SEASONAL TRAFFIC VOLUME ADJUSTMENTS

The section of US 101 within the study corridor is subject to significant variations in traffic levels throughout the year, largely because US 101 is a link to popular recreation destinations on the Oregon coastline. Outside of urbanized areas, ODOT requires that transportation facilities be analyzed under design hour volumes, known as 30th highest hour volumes. The 30th highest hour volumes are used in traffic operations analysis so that results are valid for all but a few hours of the year.

TPAU has developed a methodology to develop design hour volumes (DHVs) based on seasonally adjusting traffic volumes collected at any time of the year. This procedure utilizes automatic traffic recorders (ATRs), which consist of permanent stations that monitor traffic volumes throughout the year. The nearest ATRs to the study area are located on US 101 approximately 11 miles to the north and 11 miles to the south of Transpacific Parkway.

The peak hour counts were conducted in August of 2014 which is at or near to the time when recreational traffic is typically at its highest. Of the four most current years of data (2009 to 2012) August was the peak month for three of those four years. Therefore, a seasonal adjustment was not made to the August 2014 counts.

3.1.3. HISTORICAL GROWTH ADJUSTMENT

Due to the downturn in the economy and the higher cost of gas, traffic volumes in and around the study area have remained relatively consistent, or have, in some locations, decreased since the summer of 2008. Traffic volumes in both 2010 and 2012 indicate that this flat or downward trend is continuing.

3.1.4. VOLUME BALANCING

Volume balancing is a technique applied to traffic volumes after growth and seasonal adjustments are applied to obtain a cohesive network. Volume balancing is based on engineering judgment, weighing the importance of the count date, the traffic patterns, and the surrounding land uses. The exercise attempts to make volumes entering and exiting intersections “balance”. Volume balancing was performed for both the AM and PM models and for heavy vehicles. The volume of heavy vehicles is balanced within the study area intersections.

3.1.5. ADJUSTED EXISTING TRAFFIC VOLUMES

Figures 1 and 2 illustrate, existing 2014 weekday AM and PM volumes at all study area intersections.

3.2. EXISTING TRAFFIC OPERATIONS

This section summarizes the findings from the traffic operations analyses conducted on the study area intersections under existing (2014) conditions during the peak summer month of August. All analysis volumes have been manually balanced between intersections. Traffic operations were analyzed at each of the study area intersections during the following time periods:

- Existing 2014 weekday AM peak hour (6:00 AM to 7:00 AM), August
- Existing 2014 weekday PM peak hour (4:30 PM to 5:30 PM), August

While the 6:00 to 7:00 AM hour is not the peak hour for the adjacent roadway traffic, the addition of the construction trips will cause a shift in the AM peak hour to the 6:00 to 7:00 AM hour, therefore, this will be studied in the existing and no-build analysis as the AM peak hour. Existing traffic operations and queuing are reported in **Table 1 and Table 2**, respectively, and the overall operations are depicted graphically in **Figures 1 and 2**. For the signalized intersection of US 101 and East Bay Drive, the LOS is reported as the average LOS for all movements at the intersection. For the other study area intersections (all unsignalized), operations are only reported for critical stopped or yielding movements**. Appendix C** contains the operations analysis worksheets.

Table 1: Existing Traffic Operations Summary

Analysis Hour		Jordan Cove at Transpacific	Horsefall Beach at Transpacific	Boxcar Hill at Transpacific	US 101 at Transpacific	US 101 at East Bay	US 101 at Ferry
2014 AM (6:00 - 7:00)	Critical Movement	NB L/R	SBL	No side street volume	EB L/R	Overall	WBL
	v/c	0.02	0.01		0.05	0.33	0.01
	Delay (s) / LOS	9 / A	9 / A		12 / B	5 / A	12 / B
2014 PM (4:30 - 5:30)	Critical Movement	NB L/R	SBL	SBL	EB L/R	Overall	WBL
	v/c	0.04	0.03	0.01	0.24	0.54	0.05
	Delay (s) / LOS	9 / A	10 / A	10 / B	16 / C	5 / A	28 / D

Source: Synchro

Table 2: Existing 95th Percentile Queues (in Feet)

Intersection	Movement	2014 AM (6:00 - 7:00)	2014 PM (4:30 - 5:30)
Jordan Cove at Transpacific	WBL	25	25
	NB L/R	50	25
Horsefall Beach at Transpacific	EBL	0	0
	SBL	25	50
	SBR	0	0
Boxcar Hill at Transpacific	EB L/T/R	0	0
	WBL	0	0
	NB L/T/R	0	25
	SBL	0	50
	SB T/R	0	25
US 101 at Transpacific	EB L/R	75	125
	NBL	50	75
US 101 at East Bay	WBL	75	75
	WBR	50	50
	NBT	100	250
	NBR	25	100
	SB L/T	125	325
US 101 at Ferry	WBL	25	50
	WBR	50	25
	SB L/T	25	50

Source: SimTraffic

The analysis shows that all study area intersections meet the ODOT v/c mobility targets during both AM and PM weekday peak hour conditions under existing conditions. An analysis of vehicle queuing, as summarized in **Table 2**, shows that most vehicle queues do not extend beyond 150 feet under existing conditions with the only exceptions being at the signalized intersection of US 101 with East Bay. Both the northbound through movement and the shared southbound left/through movements would have slightly longer queue lengths in the PM peak hour typical for intersections with traffic signals.

4. BACKGROUND CONDITIONS

The peak of construction of the SDPP is currently expected to occur in the summer of 2018. The analysis addresses the month of anticipated peak construction activity during that time period.

4.1. TRAFFIC VOLUME DEVELOPMENT

Peak construction activities, and peak adjacent roadway volumes, are expected to occur at the same time during the summer of 2018. To be conservative, background volume increases related to population and employment increases have been assumed. Existing traffic volumes were adjusted upward to represent year 2018 conditions. Based on the ODOT Future Volume Tables, a linear growth rate of 0.8 percent per year was applied to the existing traffic volumes.

4.2. FUTURE BACKGROUND TRAFFIC OPERATIONS

This section summarizes the findings from the traffic operations analyses conducted on the study area intersections under future background (2018) traffic volumes that would coincide with the peak construction month of August. Traffic operations were analyzed at each of the study area intersections during the following time periods:

- Year 2018 weekday AM peak hour (6:00 AM to 7:00 AM), August
- Year 2018 weekday PM peak hour (4:30 PM to 5:30 PM), August

Background year 2018 traffic operations and queuing are reported in **Table 3 and Table 4**, respectively, and operations are depicted graphically in **Figures 3 and 4**. For the signalized intersection of US 101 and East Bay Drive, the LOS is reported as the average LOS for all movements at the intersection. For the other study area intersections (all unsignalized), LOS is reported for only the stopped or yielding critical movements. **Appendix D** contains the operations analysis worksheets.

Table 3: Future Background Traffic Operations Summary

Analysis Hour		Jordan Cove at Transpacific	Horsefall Beach at Transpacific	Boxcar Hill at Transpacific	US 101 at Transpacific	US 101 at East Bay	US 101 at Ferry
2018 AM (6:00 - 7:00)	Critical Movement	NB L/R	SBL	No side street volume	EB L/R	Overall	WBL
	v/c	0.02	0.01		0.07	0.33	0.01
	Delay (s) / LOS	9 / A	9 / A		12 / B	5 / A	12 / B
2018 PM (4:30 - 5:30)	Critical Movement	NB L/R	SBL	SBL	EB L/R	Overall	WBL
	v/c	0.04	0.03	0.02	0.29	0.56	0.09
	Delay (s) / LOS	9 / A	10 / A	10 / B	18 / C	5 / A	30 / D

Source: Synchro

Table 4: Future Background 95th Percentile Queues (in Feet)

Intersection	Movement	2018 AM (6:00 - 7:00)	2018 PM (4:30 - 5:30)
Jordan Cove at Transpacific	WBL	25	25
	NB L/R	50	50
Horsefall Beach at Transpacific	EBL	0	0
	SBL	25	50
	SBR	0	0
Boxcar Hill at Transpacific	EB L/T/R	0	25
	WBL	0	0
	NB L/T/R	0	50
	SBL	0	50
	SB T/R	0	25
US 101 at Transpacific	EB L/R	75	150
	NBL	50	75
US 101 at East Bay	WBL	75	75
	WBR	50	50
	NBT	100	250
	NBR	50	100
	SB L/T	125	325
US 101 at Ferry	WBL	25	50
	WBR	50	50
	SB L/T	25	100

Source: SimTraffic

The analysis shows that all study area intersections meet the ODOT v/c mobility target during both AM and PM weekday peak hour conditions under future background conditions. An analysis of vehicle queuing, as summarized in **Table 4**, shows that most vehicle queues do not extend beyond about 150 feet under future background conditions with the only exceptions being at the signalized intersection of US 101 with East Bay. Both the northbound through movement and the shared southbound left/through movements would have longer queue lengths typical for intersections with traffic signals.

5. CONSTRUCTION RELATED CONDITIONS- NO MITIGATION

To understand construction related impacts, site-generated trips from construction activities were estimated and assigned to the transportation network then added to background volumes to estimate total traffic. Traffic operations analyses were then performed on the network under total traffic conditions and compared with the background conditions. Conditions are first evaluated without any efforts to mitigate potential impacts of the proposed project and then with mitigation that could bring operations to acceptable levels. This section describes the process and findings associated with the analysis of construction traffic impacts.

5.1. PEAK CONSTRUCTION TRAFFIC VOLUMES

The analysis of construction-related conditions addresses conditions when construction activity is expected to be greatest as well as when the traffic on the adjacent roadway peaks. Development of total traffic volumes under construction conditions are described below.

5.1.1. WORK SHIFTS AND STAFFING

Construction of the SDPP is expected to take place over a 39-month period and will require approximately 500 employees that will include: supervisor staff, support staff, and field construction staff. **Figure 5** shows anticipated staffing levels over the duration of construction activities.

Maximum staffing is expected to coincide with the peak roadway traffic month of August 2018, when there will be approximately 500 daily employees. It should be noted that site-generated traffic volumes during the majority of the 39-month construction period will be significantly lower than peak levels, as will background traffic volumes. The traffic analysis described in this report represents maximum construction traffic as well as maximum seasonal traffic volumes.

It is anticipated that employees will work ten-hour shifts, Monday through Friday, approximately between the hours of 6:00 AM and 6:00 PM. There will be two different shifts that have start and end times that staggered by roughly an hour. These shifts account for a half-hour lunch break. The expected influx of large numbers of employees between 6:00 and 7:00 AM will result in a temporary shifting of the AM peak hour. Explained differently, the highest traffic volumes at study area intersections were observed to occur between 7:15 AM and 8:15 AM. The addition of peak construction-related traffic will cause the traffic volumes at study area intersections to be higher during the 6:00 AM to 7:00 AM period than during the existing peak hour. The existing observed PM peak hour, which occurs between 4:30 PM and 5:30 PM, will not change because the construction work shift would end during this time period.

5.1.2. TRIP GENERATION

The standard reference for trip generation data, *Trip Generation, Ninth Edition*, published by the Institute of Transportation Engineers, does not contain data for construction trips. Therefore, it was necessary to estimate trip generation based on available sources. The following sections describe the methodologies employed to estimate the number of construction vehicle trips and truck trips generated during peak construction activities.

The majority of construction personnel will be transported to the site by buses from the temporary workforce housing accessed off of US 101 at Ferry Road. A small portion of employees will travel to the site in personal vehicles. Because almost all of the employees will work during one of two ten-hour shifts, with start times staggered by 45 minutes, all personal vehicle AM trips were assumed to be inbound and all PM trips were assumed to be outbound. A total of 24 bus trips (includes inbound and outbound) were assumed in the AM peak hour. During the PM peak hour, a total of 27 bus trips (includes inbound and outbound) were assumed. Personal vehicle employee trips were estimated at 34 inbound trips during the AM peak and 50 outbound trips during the PM peak to account for the varying start and end times for the employees traveling by personal vehicle.

Inbound and outbound deliveries to the site are assumed to be staggered over the entire workday, with inbound deliveries arriving evenly between the first seven hours of the ten hour workday, and outbound delivery trucks leaving the site evenly throughout the last seven hours of the ten hour day. Deliveries to and from the site are calculated to be 18 trips during both the AM and PM peak periods, including four security personnel trips.

Based on these assumptions construction trip generation is:

- AM Peak Period:
    - 18 deliveries (including security) inbound to the site
    - 24 bus trips (12 inbound/12outbound)
    - 34 inbound personal vehicle trips
- PM Peak Period
    - 18 deliveries (including security) outbound from the site
    - 27 bus trips (13 inbound/14 outbound)
    - 50 outbound personal vehicle trips

5.1.3. TRIP DISTRIBUTION AND ASSIGNMENT

Based on assumptions from the construction team, the split of delivery vehicles is assumed to be 50 percent to/from the south and 50 percent to/from and north on US 101. Security vehicles are assumed to come from the city of North Bend. Personal vehicle trips and buses are assumed to transport workers back and forth between the site and the workforce housing accessed off of US 101 via Ferry Road. **Figures 6 and 7** show the estimated trip distribution and the corresponding site-generated trips assigned to each of the study area intersections for both the weekday AM and PM peak hours.

5.1.4. FORECAST TRAFFIC VOLUMES

Total traffic volumes consist of background traffic plus site-generated trips. **Figures 8 and 9**Error! Reference source not found. show year 2018 total traffic volumes anticipated to occur during the AM and PM peak hours, respectively.

5.1.5. OTHER ASSUMPTIONS

In traffic analysis, the flow rate for the peak 15-minutes is calculated by dividing the hourly volume by a peak hour factor *(PHF)*, which is a number between 0.00 and 1.00. Following the procedures set forth in the Analysis and Procedures Manual, analysis of total traffic conditions assumed that peak hour factors would change. Generally US 101 was assumed to have a PHF of at least 0.95 while Transpacific Parkway was assumed to have a PHF of at least 0.85 in the future scenarios.

5.2. YEAR 2018 TOTAL TRAFFIC OPERATIONS – NO MITIGATION SCENARIO

The analysis shows that all study area intersections meet the ODOT v/c mobility target during both AM and PM weekday peak hour conditions under future total peak construction traffic conditions. **Table 5 and Table 6** summarize traffic operations analysis and queuing, respectively, for year 2018 total peak construction traffic conditions during the peak summer construction analysis periods. **Figures 8 and 9** depict the overall traffic operations graphically.

The analysis summarized below assumed that the existing alignments, lane configurations and traffic control would be unchanged from current conditions. These scenarios correspond to unmitigated conditions where all construction related traffic arrives and departs. **Appendix E** contains the operations analysis worksheets.

Table 5: 2018 Total Non-Mitigated Traffic Operations Summary

Analysis Hour		**Jordan Cove at Transpacific**	**Horsefall Beach at Transpacific**	**Boxcar Hill at Transpacific**	**US 101 at Transpacific**	**US 101 at East Bay**	**US 101 at Ferry**
2018 AM (6:00 - 7:00)	Critical Movement	NB L/R	SBL	WBL	NBL	Overall	WBL
	v/c	0.02	0.01	0.05	0.09	0.33	0.08
	Delay (s) / LOS	9 / A	9 / A	8 / A	9 / A	5 / A	11 / B
2018 PM (4:30 - 5:30)	Critical Movement	NB L/R	SBL	NB L/T/R	EB L/R	Overall	SB L/T
	v/c	0.04	0.03	0.13	0.49	0.57	0.11
	Delay (s) / LOS	9 / A	10 / A	10 / B	23 / C	6 / A	3 / A

Source: Synchro

Table 6: 2018 Total Non-Mitigated Traffic 95th Percentile Queues (in Feet)

Intersection	Movement	2018 AM (6:00 - 7:00)	2018 PM (4:30 - 5:30)
Jordan Cove at Transpacific	WBL	25	25
	NB L/R	50	50
Horsefall Beach at Transpacific	EBL	0	0
	SBL	25	50
	SBR	0	0
Boxcar Hill at Transpacific	EB L/T/R	0	25
	WBL	50	25
	NB L/T/R	75	100
	SBL	0	50
	SB T/R	25	25
US 101 at Transpacific	EB L/R	100	300
	NBL	75	100
US 101 at East Bay	WBL	75	75
	WBR	50	50
	NBT	125	250
	NBR	50	100
	SB L/T	125	400
US 101 at Ferry	WBL	25	50
	WBR	75	75
	SB L/T	50	425

Source: SimTraffic

The analysis of vehicle queuing, as summarized in Table 6, shows that most vehicle queues do not extend beyond about six car lengths, or 150 feet under total peak construction conditions. However, specific movements at the intersection of US 101 with Transpacific (EB L/R), US 101 with East Bay (NBT and SB L/T), and US 101 with Ferry (SB L/T) during the PM peak experience queues longer than 200 feet.

6. IMPROVEMENT ALTERNATIVE AND ANALYSIS

As the previous section showed, the addition of construction-related traffic volumes onto the network does not have significant operational impacts to the surrounding intersections (i.e., no locations would exceed operational targets). The proposed mitigation measure is not required for operational deficiencies, but focused on improving traffic safety for construction and non-construction related traffic through the study area.

6.1. MITIGATION IMPROVEMENT

The one roadway improvement proposed for safety is the widening of Transpacific Parkway at US 101 to provide dedicated left- and right-turn lanes. The addition of dedicated turn lanes provides storage for vehicles and construction related deliveries to wait for acceptable gaps before making turns onto US 101 without causing excessive delay or queuing.

6.2. YEAR 2018 TOTAL TRAFFIC OPERATIONS – WITH MITIGATION SCENARIO

Traffic operations analyses were performed at the study area intersections with the addition of dedicated left- and right-turn lanes on Transpacific Parkway at US 101. **Table 7 and Table 8** show the results of this analysis and **Figures 10 and 11** depict the volumes and findings graphically. **Appendix F** contains the operations analysis worksheets.

Table 7: 2016 Total Traffic Operations Summary with Mitigation

Analysis Hour		Jordan Cove at Transpacific	Horsefall Beach at Transpacific	Boxcar Hill at Transpacific	US 101 at Transpacific	US 101 at East Bay	US 101 at Ferry
2018 AM (6:00 - 7:00)	Critical Movement	NB L/R	SBL	WBL	NBL	Overall	WBL
	v/c	0.02	0.01	0.05	0.09	0.33	0.08
	Delay (s) / LOS	9 / A	9 / A	8 / A	9 / A	5 / A	11 / B
2018 PM (4:30 - 5:30)	Critical Movement	NB L/R	SBL	NB L/T/R	EBR	Overall	SB L/T
	v/c	0.04	0.03	0.13	0.33	0.57	0.11
	Delay (s) / LOS	9 / A	10 / A	10 / B	16 / C	6 / A	3 / A

Source: Synchro

Table 8: 2016 Total Traffic Operations Summary with Mitigation

Intersection	Movement	2018 AM (6:00 - 7:00)	2018 PM (4:30 - 5:30)
Jordan Cove at Transpacific	WBL	25	25
	NB L/R	50	25
Horsefall Beach at Transpacific	EBL	0	25
	SBL	25	50
	SBR	0	0
Boxcar Hill at Transpacific	EB L/T/R	0	25
	WBL	25	50
	NB L/T/R	75	100
	SBL	0	50
	SB T/R	25	25
US 101 at Transpacific	EB L	50	75
	EBR	75	100
	NBL	100	100
US 101 at East Bay	WBL	100	75
	WBR	50	50
	NBT	125	225
	NBR	50	100
	SB L/T	125	325
US 101 at Ferry	WBL	50	75
	WBR	75	75
	SB L/T	75	425

Source: SimTraffic

The analysis shows that with the proposed mitigation actions, the US 101/Transpacific Parkway intersection operations would improve from 0.49 during the PM peak hour to 0.33 for the critical movement. No change would occur during the AM peak hour because traffic on the improved approach would be minimal during the morning. All other intersections would remain unchanged from unmitigated conditions and would meet the ODOT v/c operational targets during both the AM and PM peak hours. The proposed mitigation at Transpacific Parkway and US 101 is a safety improvement for the increased construction traffic turning onto US 101, and would shorten the queuing approaching US 101 by 25 feet in the AM peak hour and by 200 feet in the PM peak hour.

7. FUTURE CONDITIONS – PLANT OPERATIONS PHASE

Traffic operations associated with regular plant operations are expected to have a negligible impact on the study area intersections. Current projections show a sustained operations workforce consisting of 30 employees in each of three shifts. This correlates to roughly 30 inbound and 30 outbound trips during each of the shift change hours. The previous construction analysis shows there is ample capacity to absorb these trips into the transportation network with negligible associated impacts. Therefore, the existing transportation system will be adequate to accommodate future trips after construction is completed.

8. TRAFFIC MONITORING

It will be the sole responsibility of the Oregon Department of Transportation to monitor the transportation impacts during the construction of the project. If, during the Project, significant transportation issues arise, a representative of the Jordan Cove Energy Project, L.P. and ODOT shall convene to resolve the issue/s. The Jordan Cove Energy Project, L.P., unless agreed to otherwise, shall be responsible for all additional corrections, modifications or improvements necessary to resolve the issues at no cost to the State.

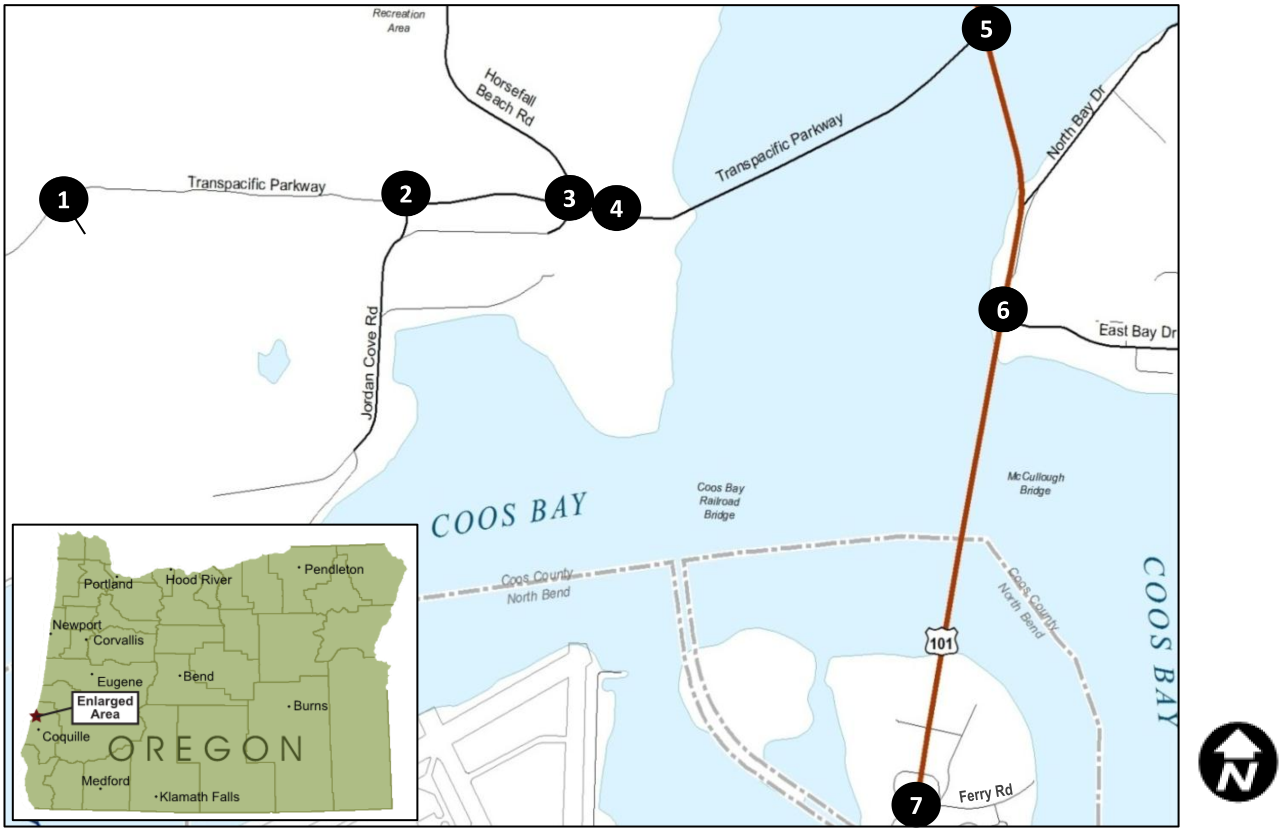
9. CONCLUSION AND RECOMMENDATIONS

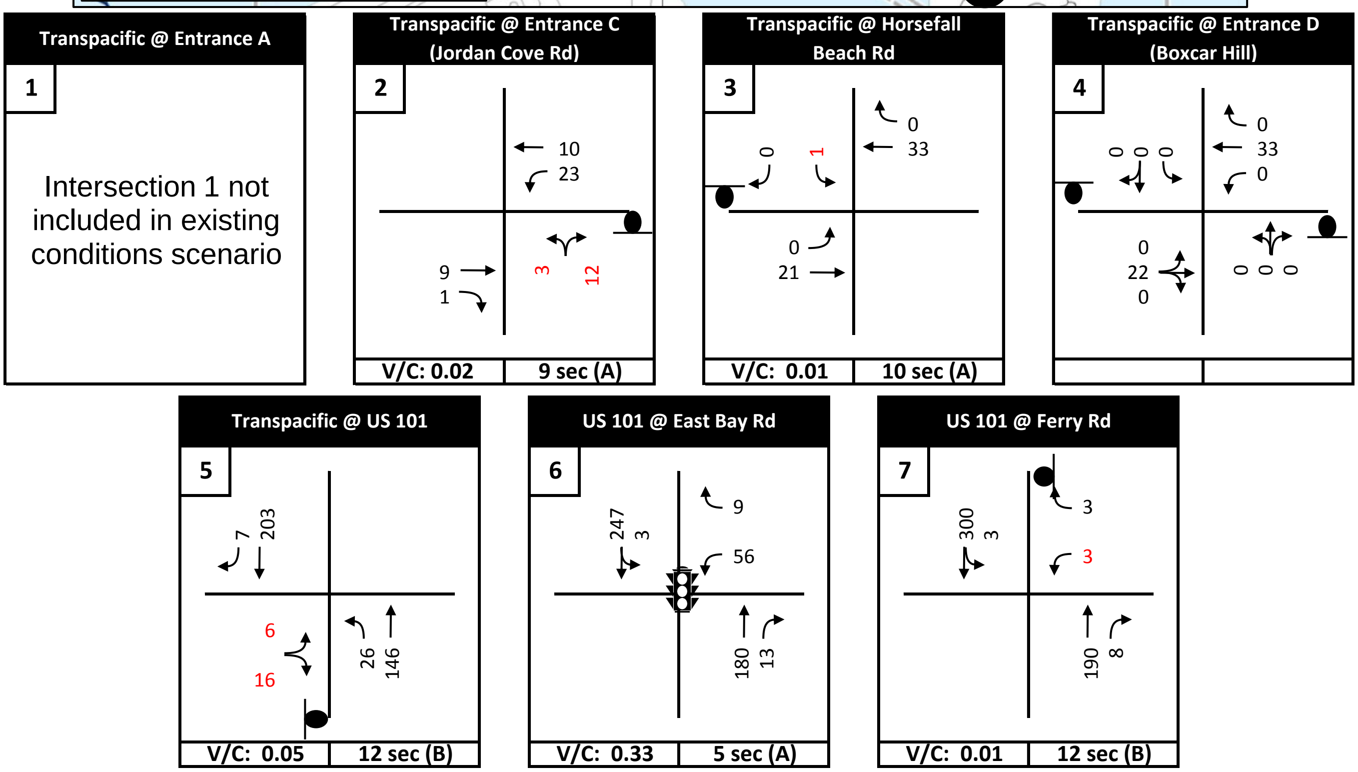
This document summarizes the traffic impacts resulting from construction activities for the proposed Jordan Cove Energy Project. The traffic analysis showed little to no operational degradation at any of the study area intersections.

In lieu of proposed operation mitigation strategies, a voluntary operational improvement is proposed to improve safety at the intersection of Transpacific Parkway and US 101. This proposed mitigation would widen Transpacific Parkway to provide dedicated left- and right-turn lanes onto US 101. Providing storage for turning vehicles and trucks allows drivers to wait for acceptable gaps along US 101 turning on to mainline traffic.

Jordan Cove Energy Project, L.P. (JCEP), would be responsible for costs associated with any needed design, installation, implementation and removal/cessation of the recommended operational improvement measure. However, of the improvement will require approval of and coordination with the appropriate roadway jurisdiction. Furthermore, businesses, agencies and land owners on the North Spit should be kept apprised of the schedule and potential transportation impacts of construction activities as well as any mitigation measures that are to be implemented.

FIGURES





Jordan Cove Energy Project - TIA | **September 2014**

Legend

Allowable Movement

AM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio
LOS - Level of Service

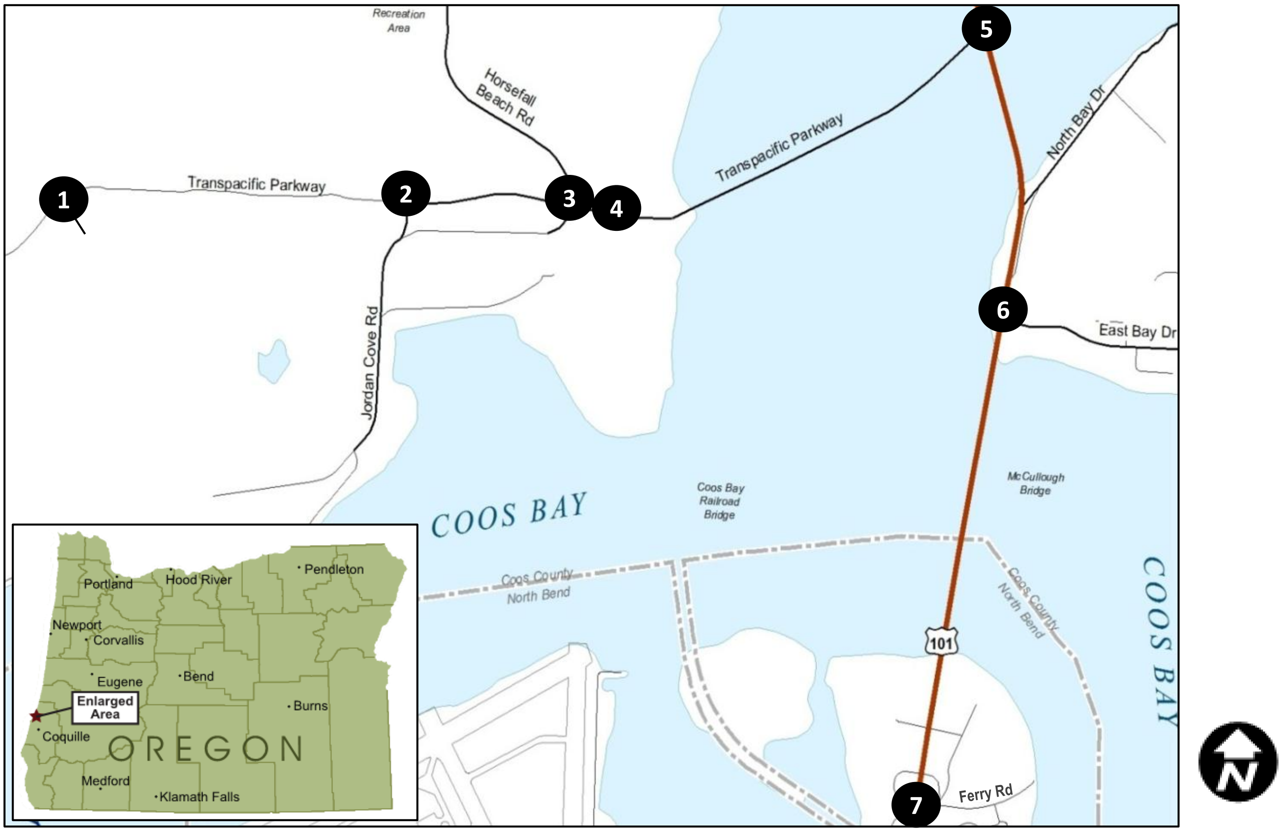
Signalized Intersection

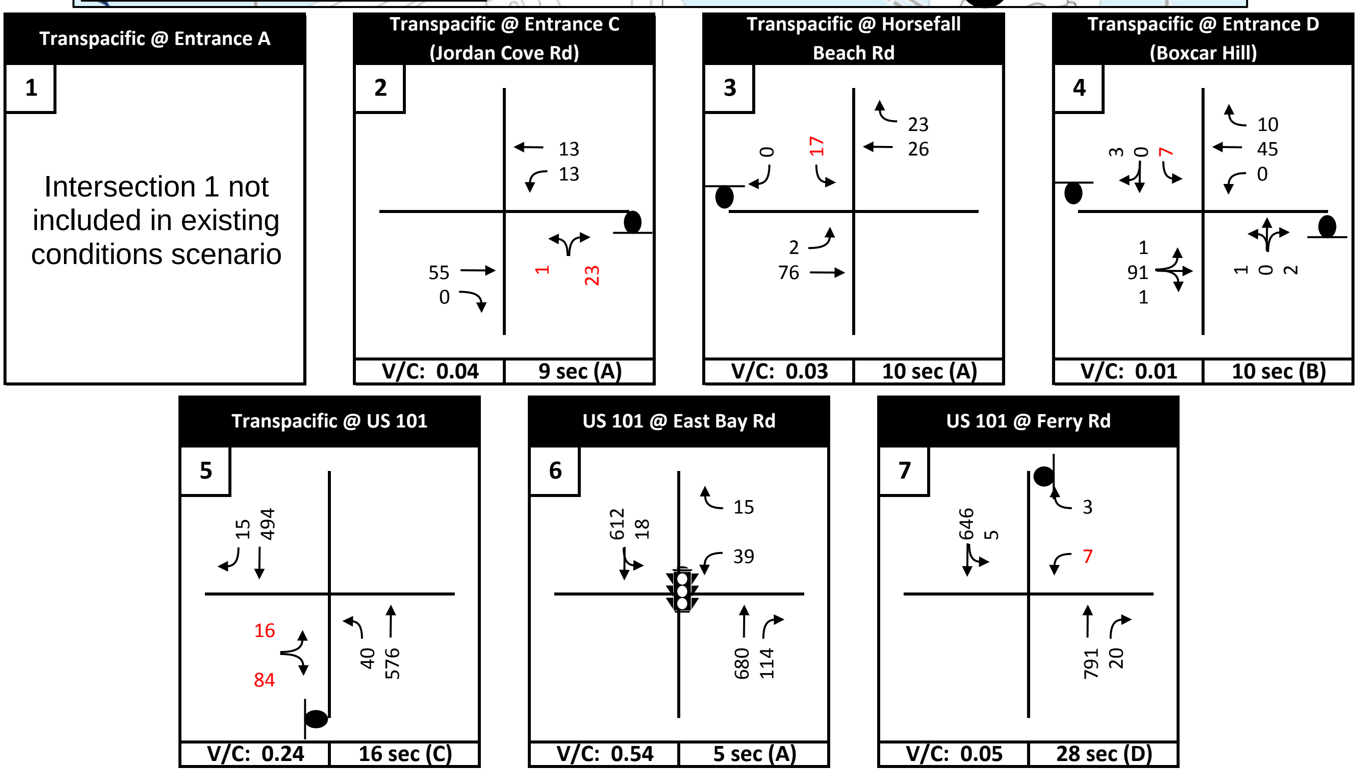
STOP Controlled Approach

Study Area Intersection

Critical Movement

Figure 1
Existing Volumes (2014)
AM Peak Hour





Jordan Cove Energy Project - TIA September 2014

Legend

Allowable Movement

\## PM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio
LOS - Level of Service

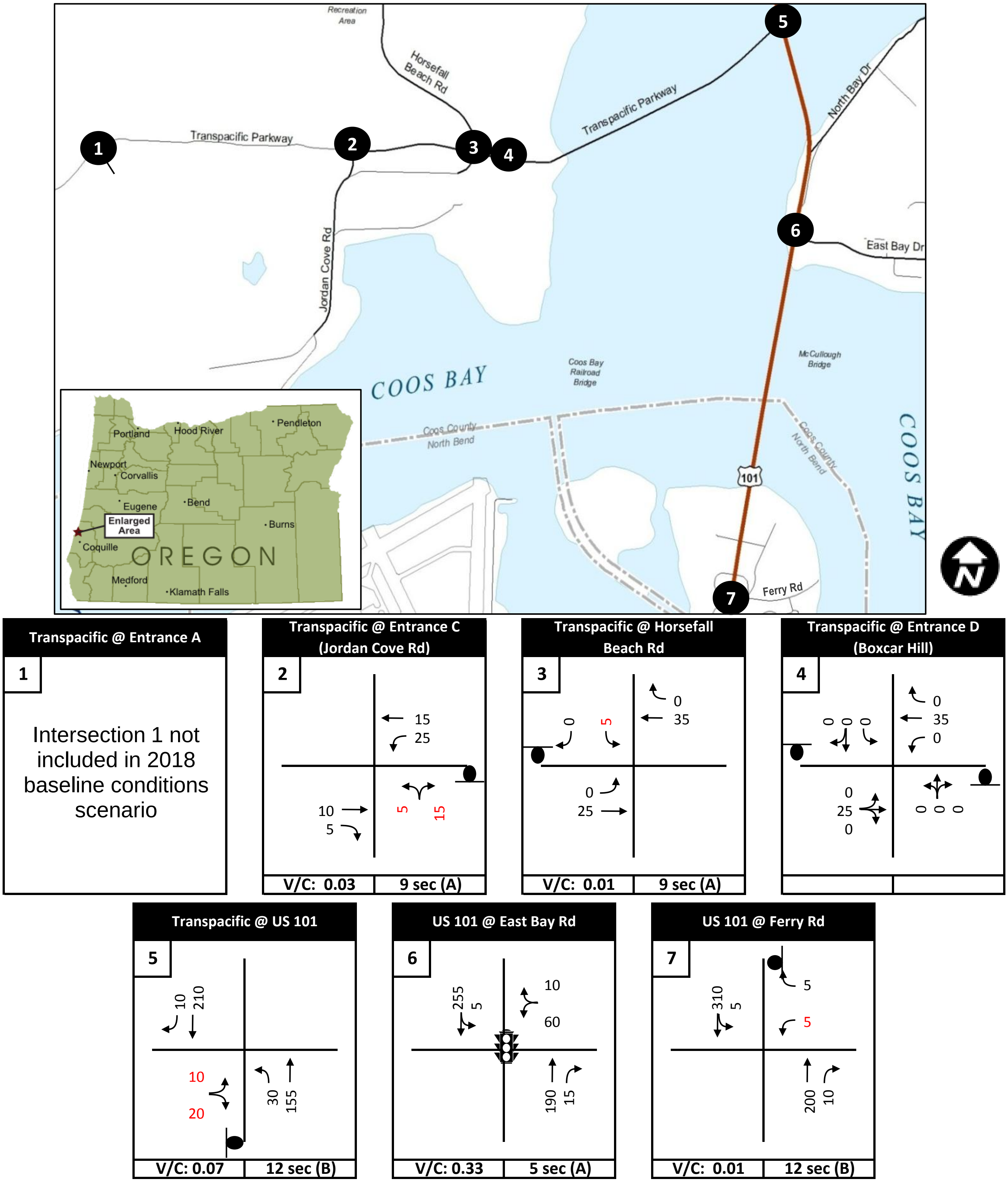
Signalized Intersection

STOP Controlled Approach

\## Study Area Intersection

\## Critical Movement

Figure 2
Existing Volumes (2014)
PM Peak Hour



Jordan Cove Energy Project - TIA | **September 2014**

Legend

Allowable Movement

\## AM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio
LOS - Level of Service

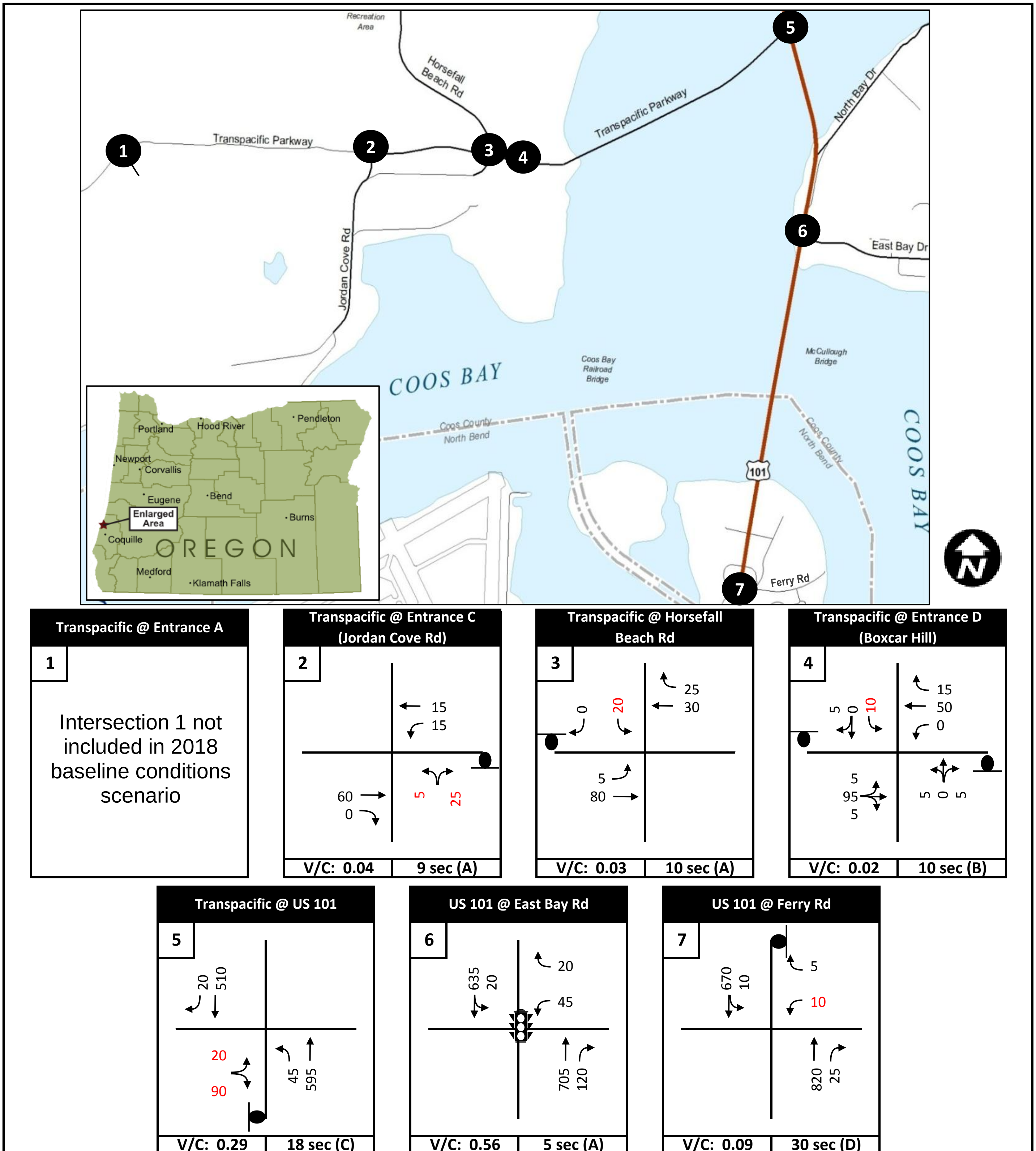
Signalized Intersection

STOP Controlled Approach

\## Study Area Intersection

\## Critical Movement

Figure 3
2018 No-Build Rounded Volumes
Existing Network
AM Peak Hour



Jordan Cove Energy Project - TIA **September 2014**

Legend

Allowable Movement

\## PM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio

LOS - Level of Service

Signalized Intersection

STOP Controlled Approach

\## Study Area Intersection

\## Critical Movement

Figure 4

2018 No-Build Rounded Volumes

Existing Network

PM Peak Hour

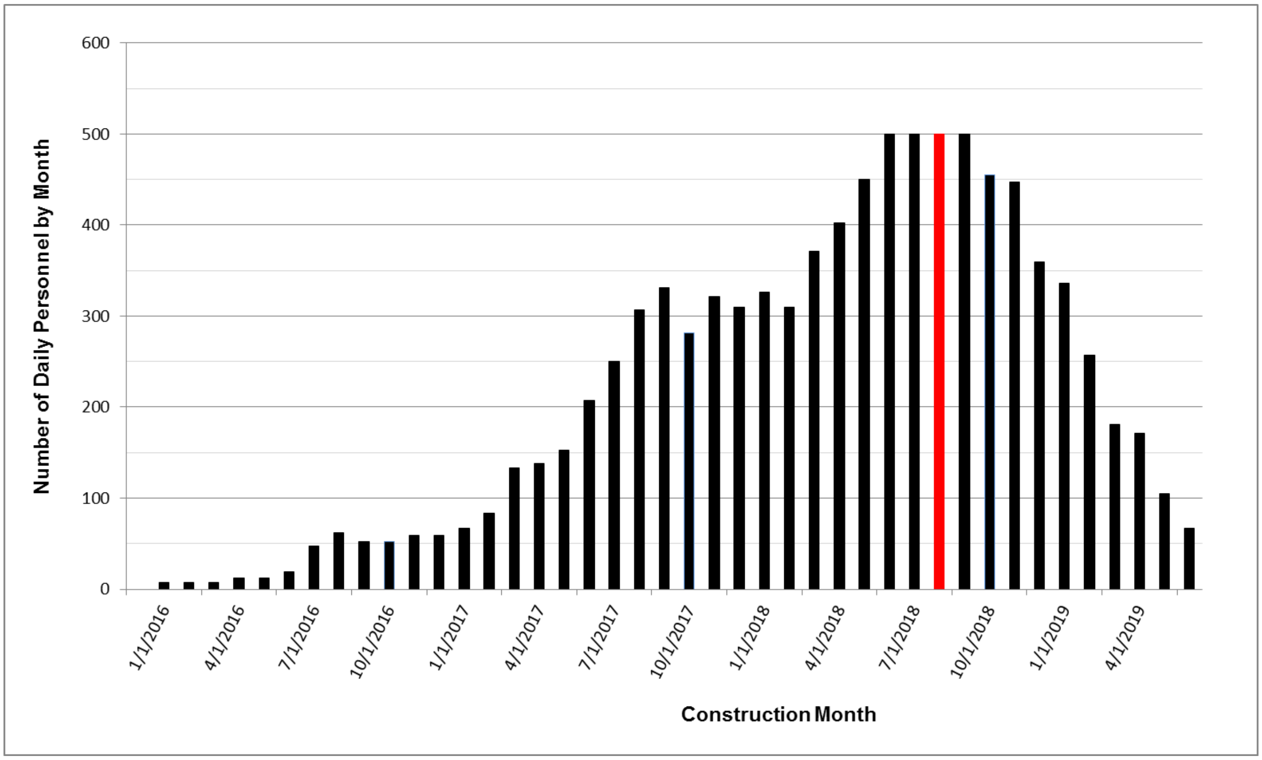
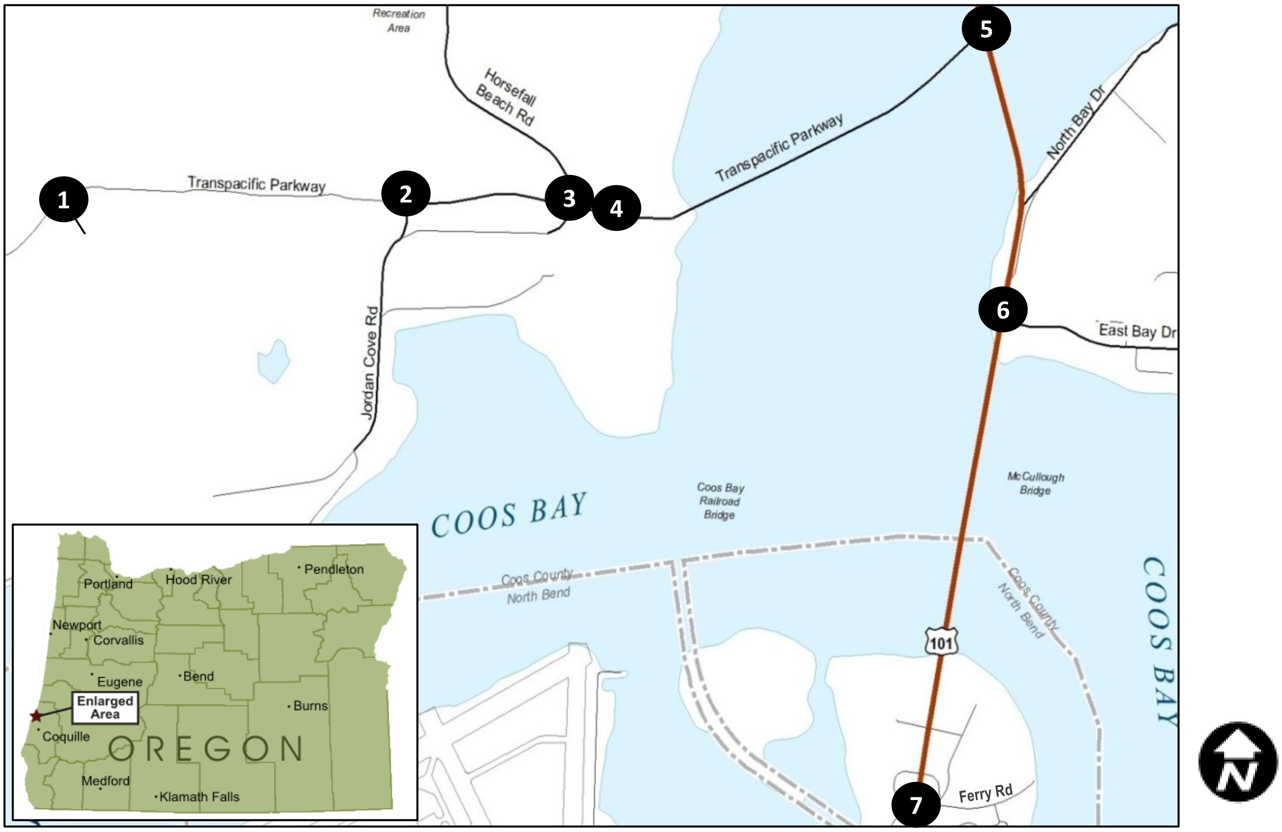
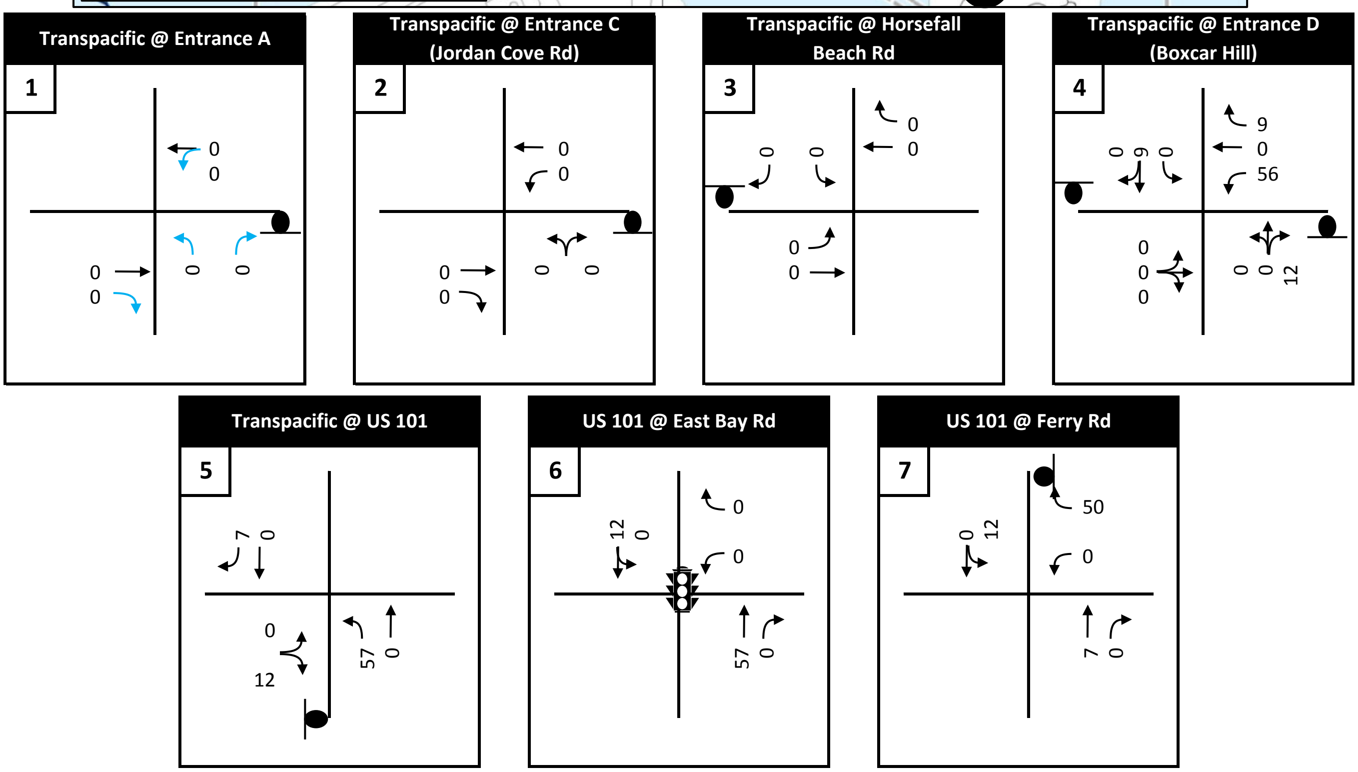


Figure 5: Estimated Number of Construction Workers by Month





Jordan Cove Energy Project - TIA

September 2014

Figure 6

EFSC Trip Distribution (2018)

Existing Network

AM Peak Hour

Legend

Allowable Movement

\## AM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio

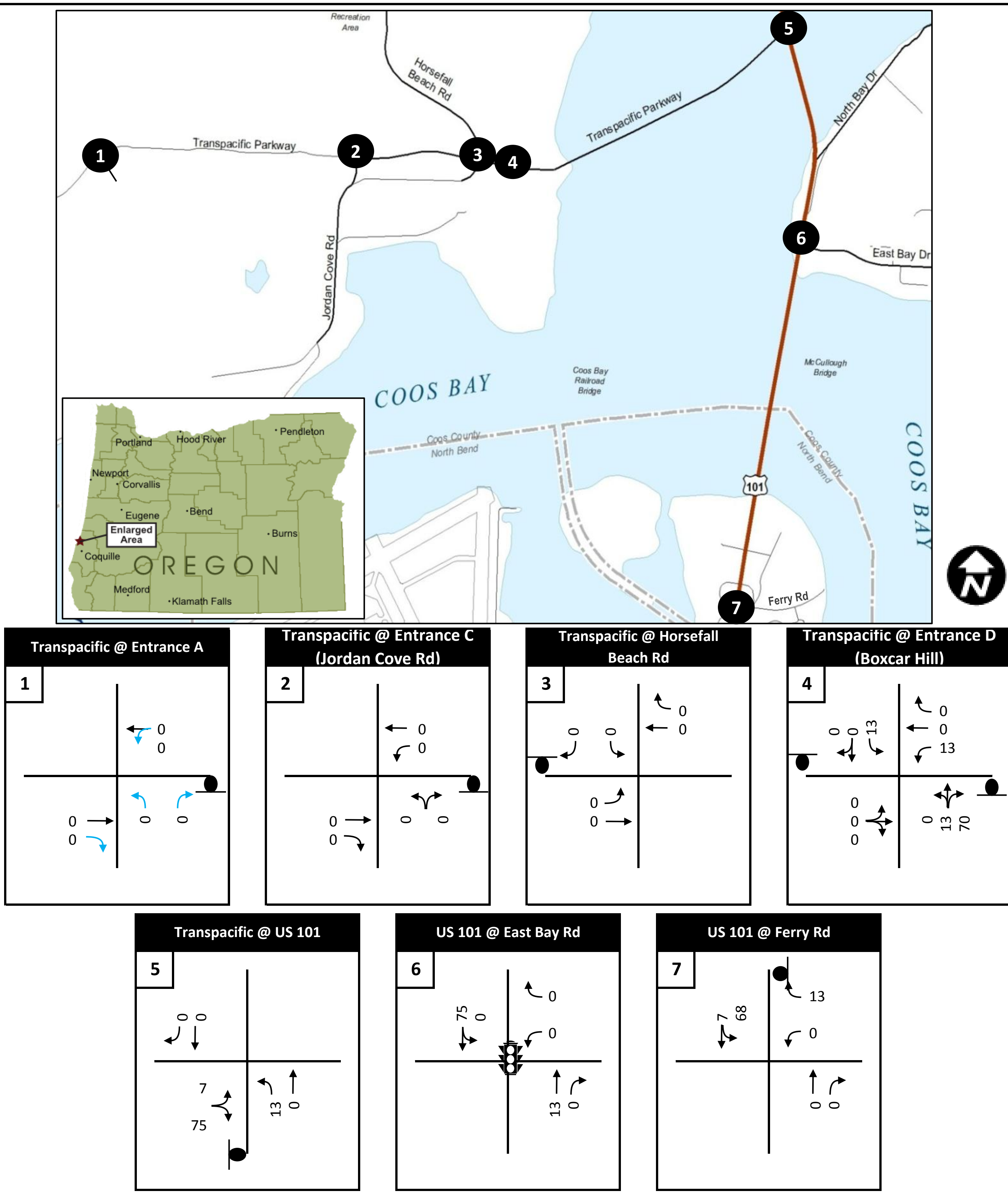
LOS - Level of Service

Signalized Intersection

STOP Controlled Approach

\## Study Area Intersection

New Lane/Movement in 2018



Jordan Cove Energy Project - TIA Update **September 2014**

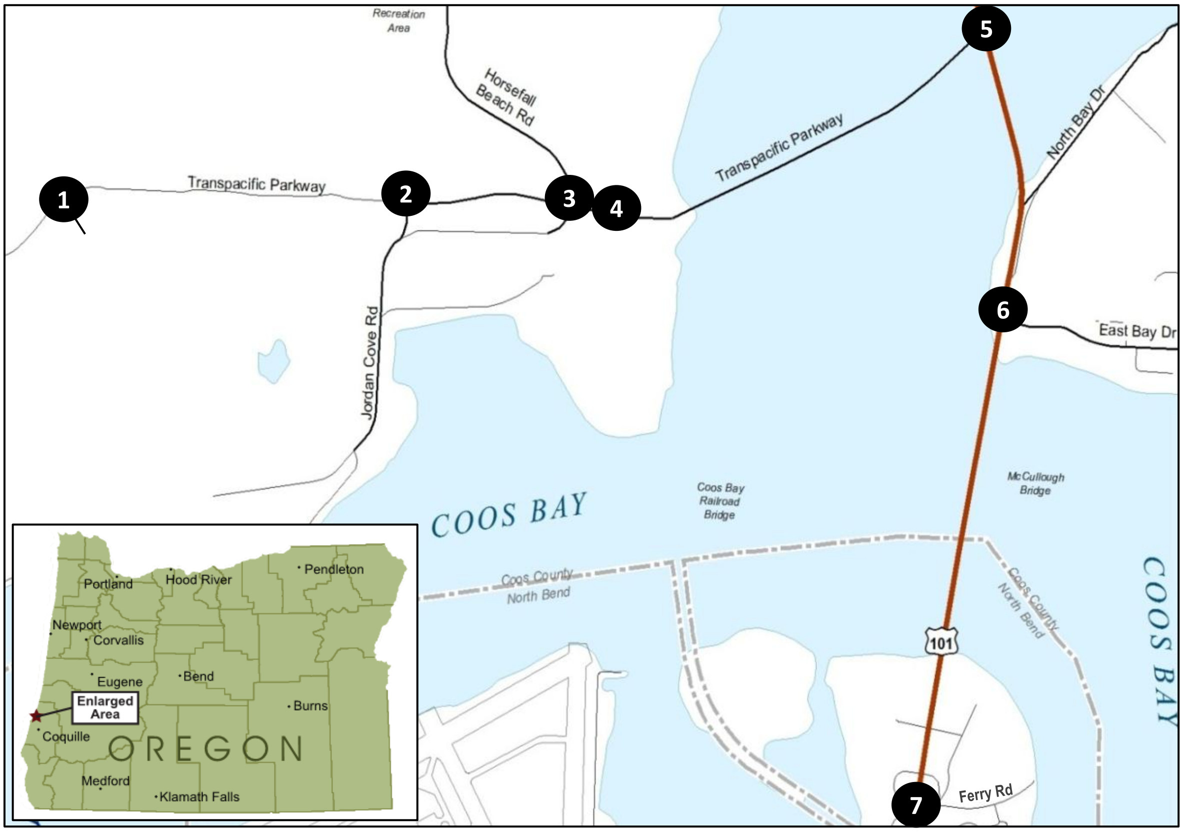
Figure 7
EFSC Trip Distribution (2018)
Existing Network
PM Peak Hour

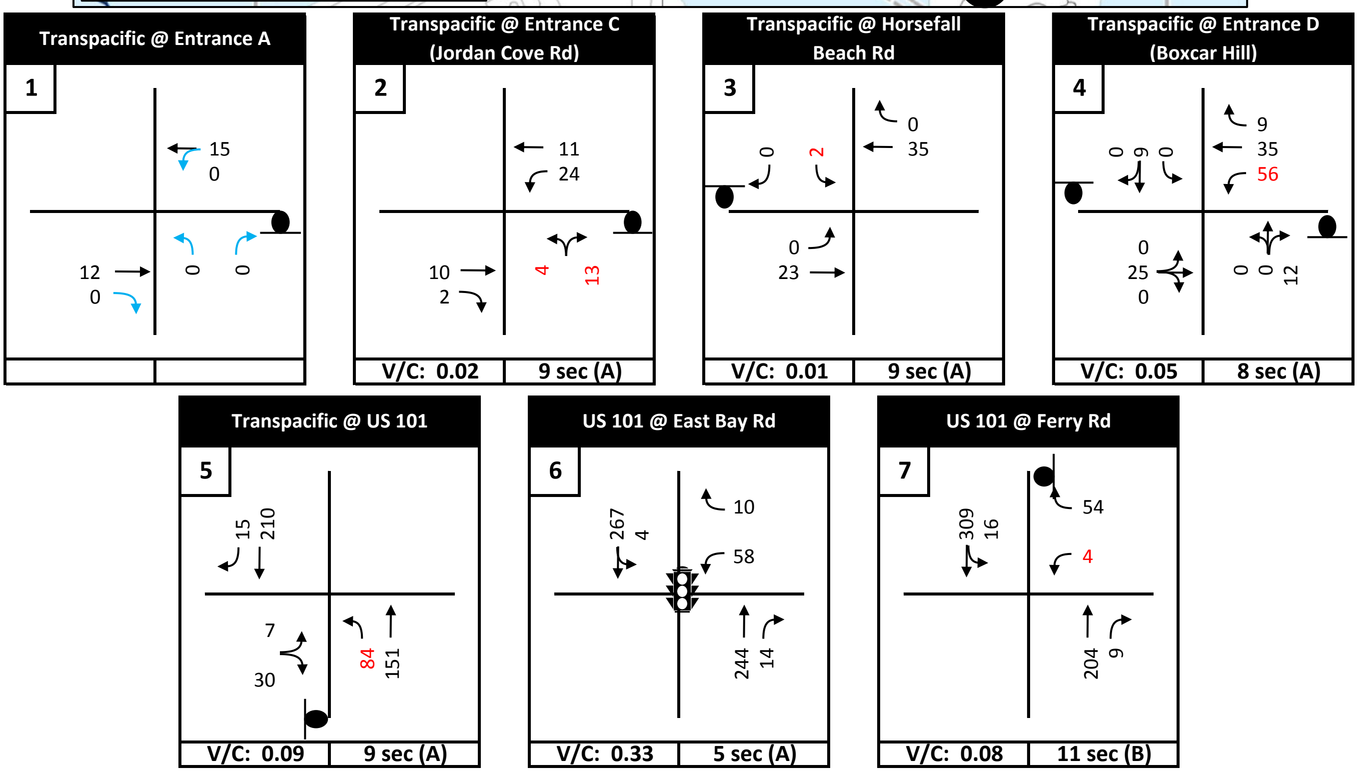
Legend

- Allowable Movement
- ## PM Peak Hour Turning Mvt. Volume
- Signalized Intersection
- STOP Controlled Approach
- ## Study Area Intersection
- New Lane/Movement in 2018

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio
LOS - Level of Service





Jordan Cove Energy Project - TIA — **September 2014**

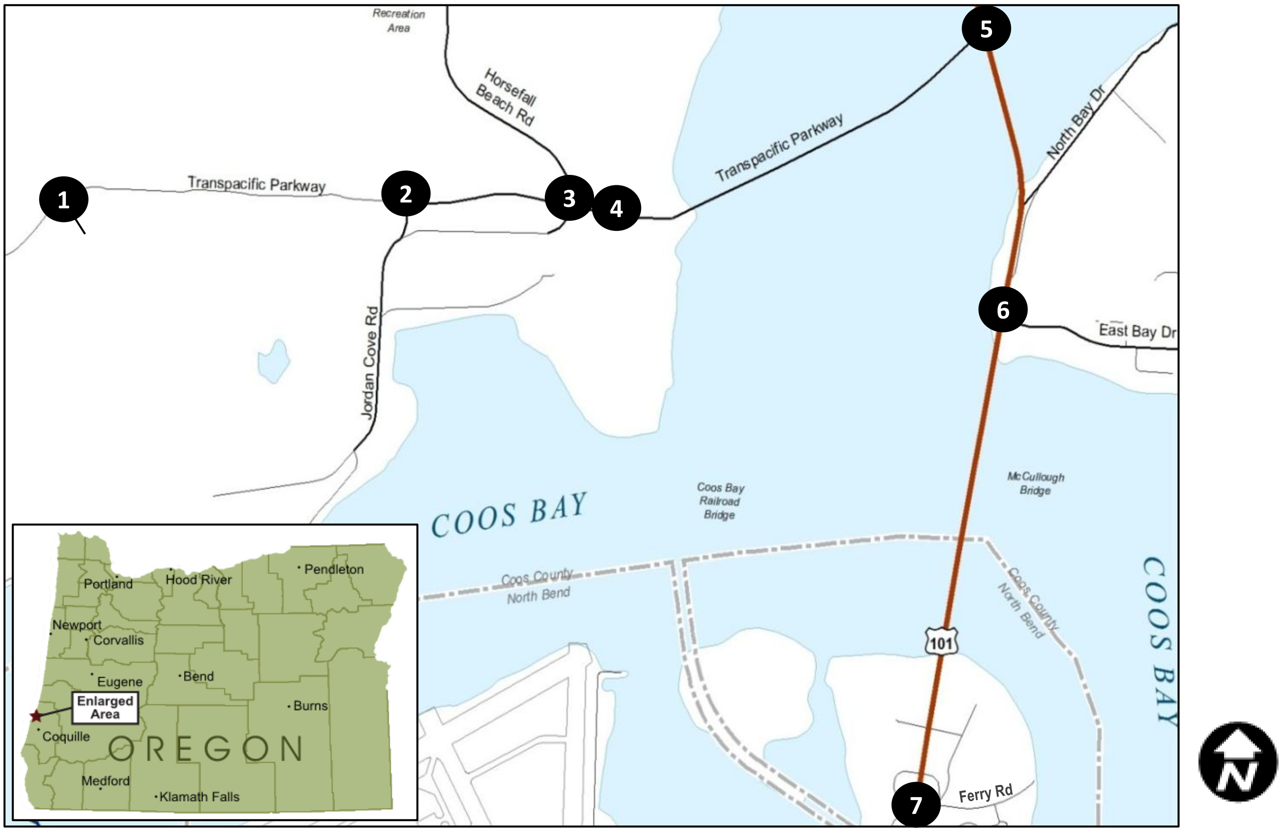
Legend

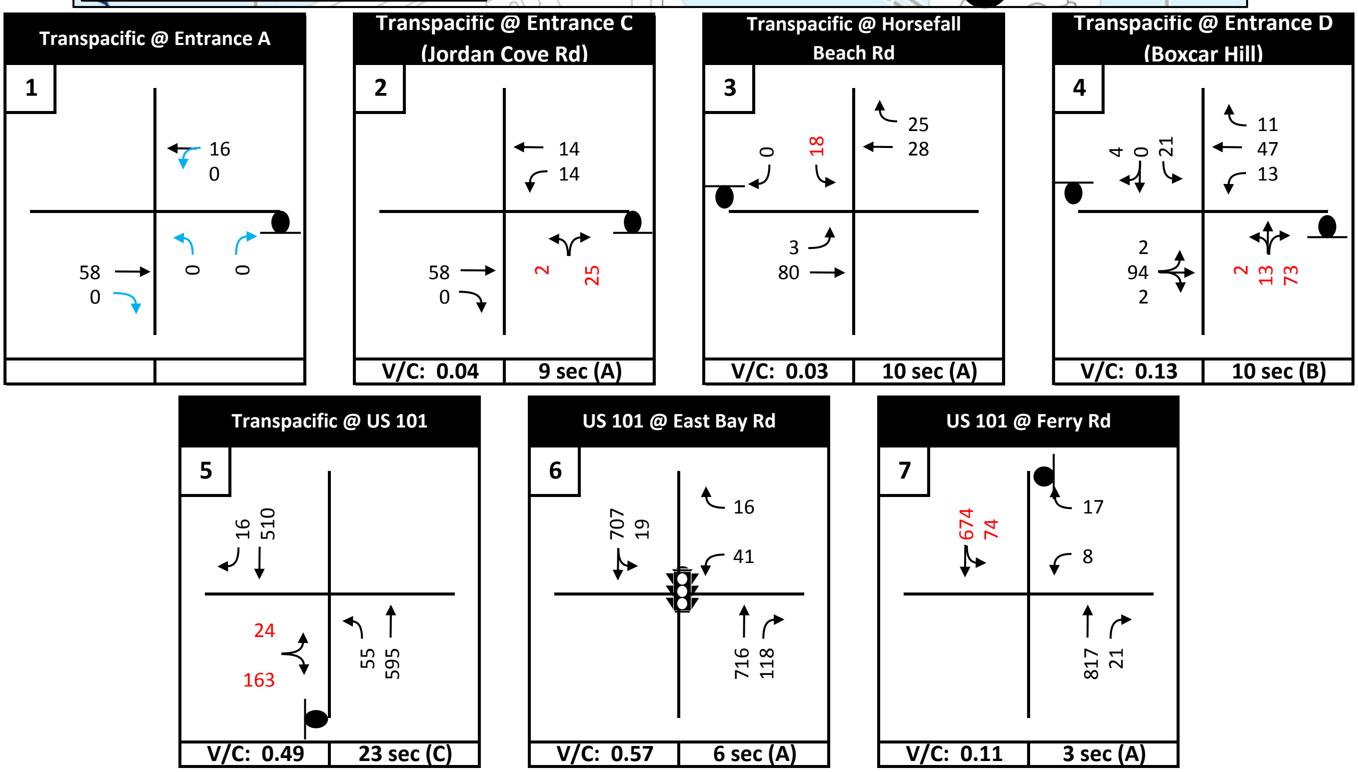
- Allowable Movement
- \## AM Peak Hour Turning Mvt. Volume
- Signalized Intersection
- STOP Controlled Approach
- \## Study Area Intersection
- \## Critical Movement
- New Lane/Movement in 2018

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio
LOS - Level of Service

Figure 8
2018 with EFSC Trips - Unrounded
Existing Network
AM Peak Hour





Jordan Cove Energy Project - TIA **September 2014**

Legend

Allowable Movement

\## PM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio
LOS - Level of Service

Signalized Intersection

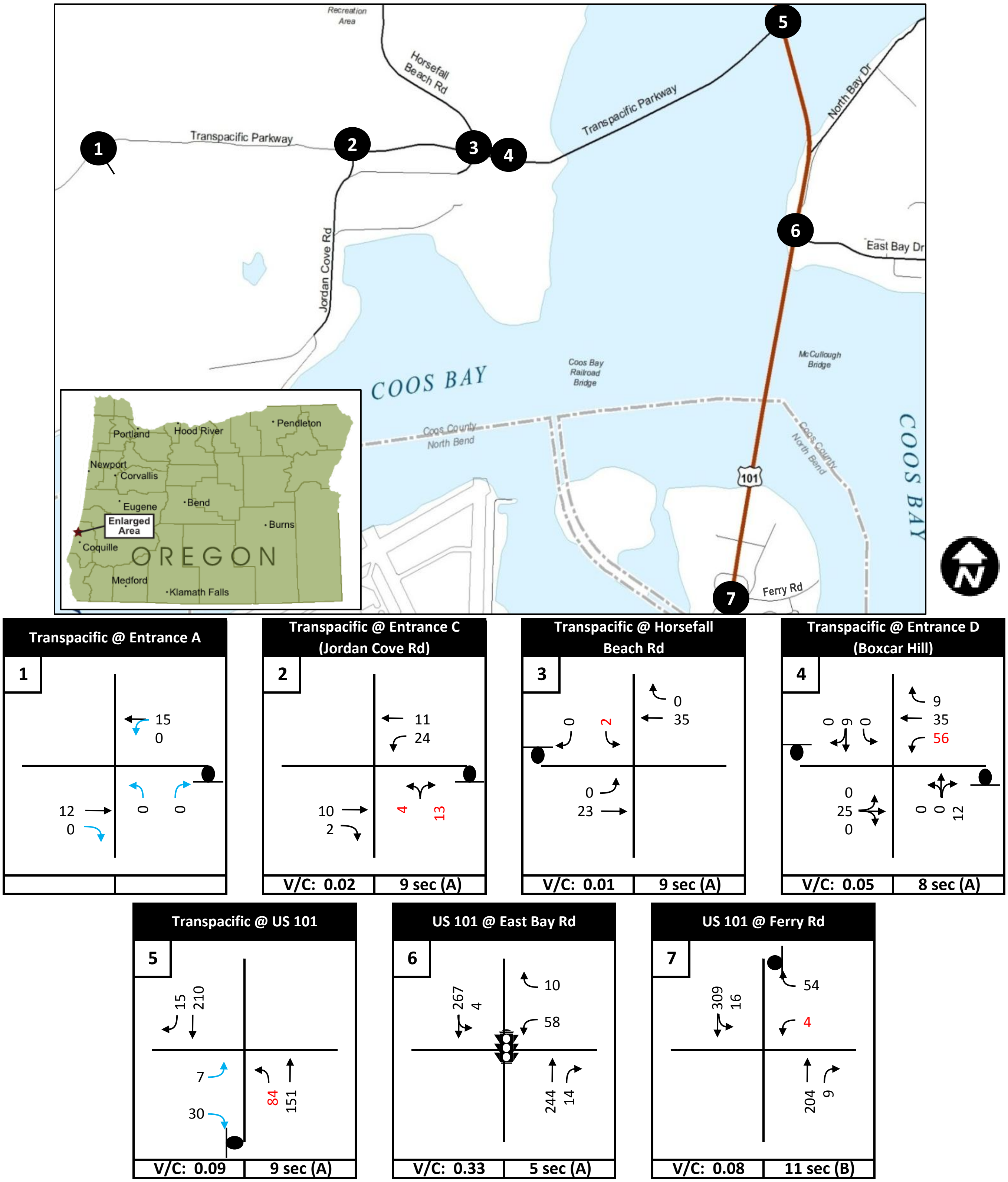
STOP Controlled Approach

\## Study Area Intersection

\## Critical Movement

New Lane/Movement in 2018

Figure 9
2018 with EFSC Trips - Unrounded
Existing Network
PM Peak Hour



Jordan Cove Energy Project - TIA | **September 2014**

Figure 10
2018 with EFSC Trips - Unrounded
Existing Network with Improvements
AM Peak Hour

Legend

Allowable Movement

AM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio
LOS - Level of Service

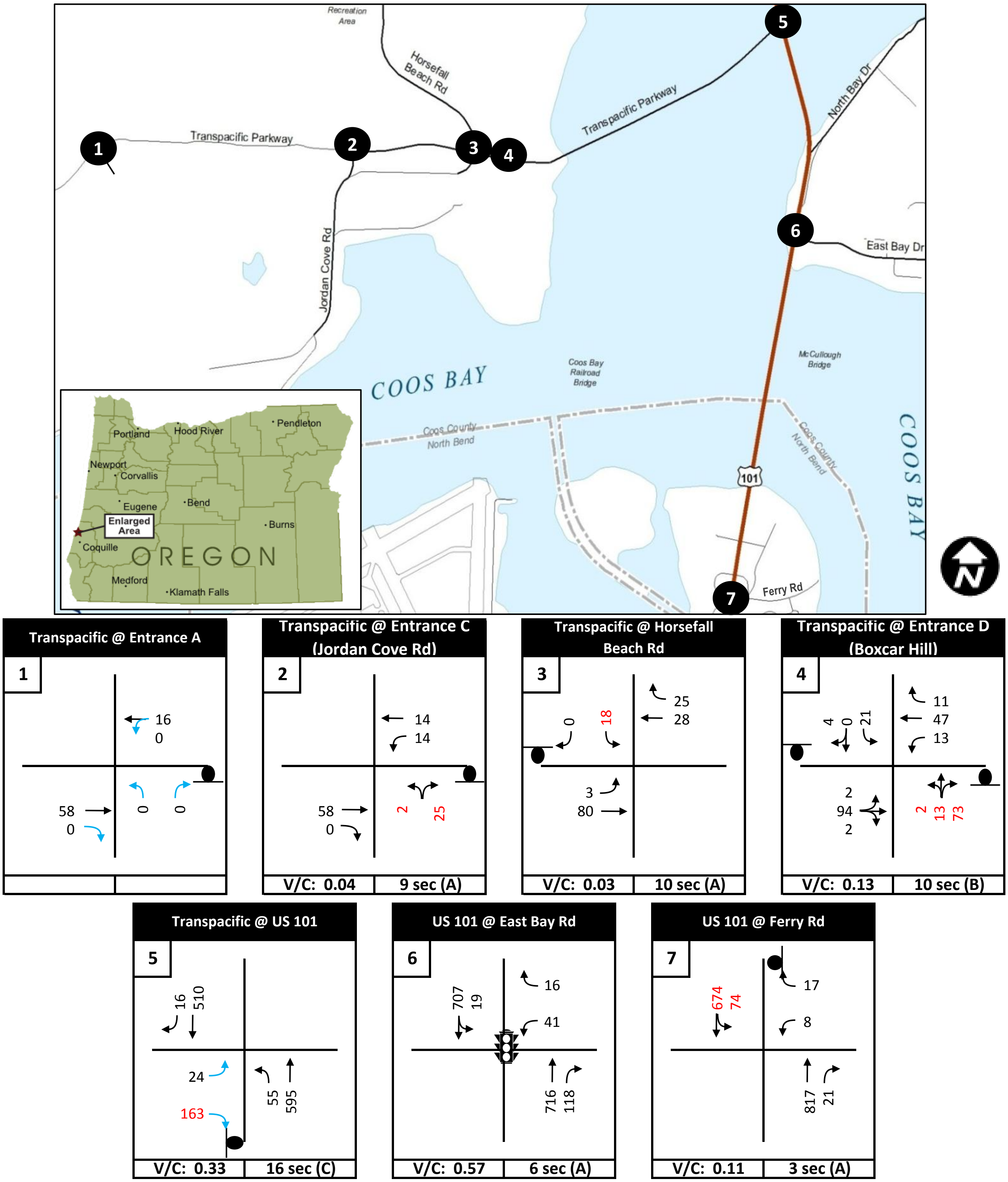
Signalized Intersection

STOP Controlled Approach

Study Area Intersection

Critical Movement

New Lane/Movement in 2018



Jordan Cove Energy Project - TIA Update **September 2014**

Figure 11

2018 with EFSC Trips - Unrounded

Existing Network with Improvements

PM Peak Hour

Legend

Allowable Movement

PM Peak Hour Turning Mvt. Volume

V/C	Delay (LOS)

V/C - Volume-to-Capacity Ratio

LOS - Level of Service

Signalized Intersection

STOP Controlled Approach

Study Area Intersection

Critical Movement

New Lane/Movement in 2018

APPENDICES

Appendix A – Traffic Volume Development

Project: Jordan Cove TIA Update
Job #: JCEP00000-007
Subject: *AM 2014 Turning Movement Volumes*
Created: 8/29/2014
Rev. Date: 9/23/2014

Growth: Years: 4; Rate: 0.80%

% Trips coming from worksite
% Trips going to worksite

Trips: 40 (Delivery); Trips: 2 (Water/Sewer); Trips: 1 (Office Supplies); Trips EXIT Housing: 30; Trips ENTER Housing: 40; Trips: 10 (Security)

Int No.	Synchro ID	Intersection	Node ID	Direction	Movement	2014 Turning Movement Count Data: 2014 Existing Turning Mvt. Counts	2014 Existing Heavy Vehicle Counts	2014 Existing HV %	2014 Existing: 2014 Existing Unrounded Volumes	2014 Existing Balancing Adjustments	2014 Existing Unrounded Balanced Volumes	Future Background: 2018 Future Back. Unrounded Volumes	2018 Future Back. Balancing Adjustments	2018 Future Back. Unrounded Balanced Volumes	2018 Future Back. Rounded Balanced Volumes
1	10	Transpacific Parkway @ Entrance A	10	EB	EBL	0	0	0.0%	0		0	0		0	0
	10		10		EBT	0	0	0.0%	0		0	0		0	0
	10	Count Date:	10		EBR	0	0	0.0%	0		0	0		0	0
	10	2014	10	WB	WBL	0	0	0.0%	0		0	0		0	0
	10		10		WBT	0	0	0.0%	0		0	0		0	0
	10		10		WBR	0	0	0.0%	0		0	0		0	0
	10		10	NB	NBL	0	0	0.0%	0		0	0		0	0
	10	PM Peak Hour Used: 6:00AM - 7:00AM	10		NBT	0	0	0.0%	0		0	0		0	0
	10	Existing PHF:	10		NBR	0	0	0.0%	0		0	0		0	0
	10	0	10	SB	SBL	0	0	0.0%	0		0	0		0	0
	10		10		SBT	0	0	0.0%	0		0	0		0	0
	10		10		SBR	0	0	0.0%	0		0	0		0	0
				TEV		**0**	**0**		**0**		**0**	**0**		**0**	**0**
2	20	Transpacific Parkway @ Entrance C (Jordan Cove Rd)	20	EB	EBL	0	0	0.0%	0		0	0		0	0
	20		20		EBT	9	7	77.8%	9		9	10		10	10
	20	Count Date: 8/13/2014	20		EBR	1	1	100.0%	1		1	2		2	5
	20	2014	20	WB	WBL	24	7	29.2%	24	(1)	23	24		24	25
	20		20		WBT	11	9	81.8%	11	(1)	10	11		11	15
	20		20		WBR	0	0	0.0%	0		0	0		0	0
	20		20	NB	NBL	3	3	100.0%	3		3	4		4	5
	20	PM Peak Hour Used: 6:00AM - 7:00AM	20		NBT	0	0	0.0%	0		0	0		0	0
	20	Existing PHF:	20		NBR	12	7	58.3%	12		12	13		13	15
	20	0.83	20	SB	SBL	0	0	0.0%	0		0	0		0	0
	20		20		SBT	0	0	0.0%	0		0	0		0	0
	20		20		SBR	0	0	0.0%	0		0	0		0	0
				TEV		**0**	**0**		**60**		**58**	**64**		**64**	**75**
3	30	Transpacific Parkway @ Horsfall Beach Rd	30	EB	EBL	0	0	0.0%	0		0	0		0	0
	30		30		EBT	21	14	66.7%	21		21	22	1	23	25
	30	Count Date: 8/13/2014	30		EBR	0	0	0.0%	0		0	0		0	0
	30	2014	30	WB	WBL	0	0	0.0%	0		0	0		0	0
	30		30		WBT	32	13	40.6%	32	1	33	35		35	35
	30		30		WBR	0	0	0.0%	0		0	0		0	0
	30		30	NB	NBL	0	0	0.0%	0		0	0		0	0
	30	PM Peak Hour Used: 6:00AM - 7:00AM	30		NBT	0	0	0.0%	0		0	0		0	0
	30	Existing PHF:	30		NBR	0	0	0.0%	0		0	0		0	0
	30	0.71	30	SB	SBL	1	0	0.0%	1		1	2		2	5
	30		30		SBT	0	0	0.0%	0		0	0		0	0
	30		30		SBR	0	0	0.0%	0		0	0		0	0
				TEV		**0**	**0**		**54**		**55**	**59**		**60**	**65**
4	40	Transpacific Parkway @ Entrance D (Boxcar Hill)	40	EB	EBL	0	0	0.0%	0		0	0		0	0
	40		40		EBT	22	14	63.6%	22		22	23	2	25	25
	40	Count Date: 8/13/2014	40		EBR	0	0	0.0%	0		0	0		0	0
	40	2014	40	WB	WBL	0	0	0.0%	0		0	0		0	0
	40		40		WBT	32	13	40.6%	32	1	33	35		35	35
	40		40		WBR	0	0	0.0%	0		0	0		0	0
	40		40	NB	NBL	0	0	0.0%	0		0	0		0	0
	40	PM Peak Hour Used: 6:00AM - 7:00AM	40		NBT	0	0	0.0%	0		0	0		0	0
	40	Existing PHF:	40		NBR	0	0	0.0%	0		0	0		0	0
	40	0.71	40	SB	SBL	0	0	0.0%	0		0	0		0	0
	40		40		SBT	0	0	0.0%	0		0	0		0	0
	40		40		SBR	0	0	0.0%	0		0	0		0	0
				TEV		**0**	**0**		**54**		**55**	**58**		**60**	**60**
5	50	Transpacific Parkway @ US 101	50	EB	EBL	6	6	100.0%	6		6	7		7	10
	50		50		EBT	0	0	0.0%	0		0	0		0	0
	50	Count Date: 8/14/2014	50		EBR	16	11	68.8%	16		16	17	1	18	20
	50	2014	50	WB	WBL	0	0	0.0%	0		0	0		0	0
	50		50		WBT	0	0	0.0%	0		0	0		0	0
	50		50		WBR	0	0	0.0%	0		0	0		0	0
	50		50	NB	NBL	29	14	48.3%	29	(3)	26	27		27	30
	50	PM Peak Hour Used: 6:00AM - 7:00AM	50		NBT	146	22	15.1%	146		146	151		151	155
	50	Existing PHF:	50		NBR	0	0	0.0%	0		0	0		0	0
	50	0.79	50	SB	SBL	0	0	0.0%	0		0	0		0	0
	50		50		SBT	203	43	21.2%	203		203	210		210	210
	50		50		SBR	9	2	22.2%	9	(2)	7	8		8	10
				TEV		**0**	**0**		**409**		**404**	**420**		**421**	**435**
6	60	US 101 @ East Bay Rd	60	EB	EBL	0	0	0.0%	0		0	0		0	0
	60		60		EBT	0	0	0.0%	0		0	0		0	0
	60	Count Date: 8/13/2014	60		EBR	0	0	0.0%	0		0	0		0	0
	60	2014	60	WB	WBL	56	5	8.9%	56		56	58		58	60
	60		60		WBT	0	0	0.0%	0		0	0		0	0
	60		60		WBR	9	1	11.1%	9		9	10		10	10
	60		60	NB	NBL	0	0	0.0%	0		0	0		0	0
	60	PM Peak Hour Used: 6:00AM - 7:00AM	60		NBT	178	35	19.7%	178	2	180	186	1	187	190
	60	Existing PHF:	60		NBR	13	2	15.4%	13		13	14		14	15
	60	0.77	60	SB	SBL	3	0	0.0%	3		3	4		4	5
	60		60		SBT	247	55	22.3%	247		247	255		255	255
	60		60		SBR	0	0	0.0%	0		0	0		0	0
				TEV		**0**	**0**		**506**		**508**	**527**		**528**	**535**
7	70	US 101 @ Ferry Rd	70	EB	EBL	0	0	0.0%	0		0	0		0	0
	70		70		EBT	0	0	0.0%	0		0	0		0	0
	70	Count Date: 8/13/2014	70		EBR	0	0	0.0%	0		0	0		0	0
	70	2014	70	WB	WBL	3	0	0.0%	3		3	4		4	5
	70		70		WBT	0	0	0.0%	0		0	0		0	0
	70		70		WBR	3	1	33.3%	3		3	4		4	5
	70		70	NB	NBL	0	0	0.0%	0		0	0		0	0
	70	PM Peak Hour Used: 6:00AM - 7:00AM	70		NBT	190	32	16.8%	190		190	197		197	200
	70	Existing PHF:	70		NBR	8	0	0.0%	8		8	9		9	10
	70	0.78	70	SB	SBL	1	0	0.0%	1	2	3	4		4	5
	70		70		SBT	295	55	18.6%	295	5	300	310	(1)	309	310
	70		70		SBR	0	0	0.0%	0		0	0		0	0
				TEV		**0**	**0**		**500**		**507**	**528**		**527**	**535**

2018 Construction Trips

Int No.	Movement	2018 Kiewit Delivery Distribution	2018 Kiewit Delivery Trips	2018 Kiewit Water/Sewer Distribution	2018 Kiewit Water/Sewer Trips	2018 Kiewit Office Supplies Distribution	2018 Kiewit Office Supplies Trips	2018 Kiewit Bus Transp. Distribution	2018 Kiewit Bus Transp. Trips	2018 Kiewit Security Distribution	2018 Kiewit Security Trips
1	EBL		0		0		0				0
	EBT		0		0		0				0
	EBR		0		0		0				0
	WBL	20%	8	50%	1		0	20%	6	20%	2
	WBT		0		0		0				0
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR		0		0		0	20%	8		0
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		**8**		**1**		**0**		**14**		**2**
2	EBL		0		0		0				0
	EBT		0		0		0	20%	8		0
	EBR		0		0		0				0
	WBL	60%	24	50%	1		0	60%	18	60%	6
	WBT	20%	8	50%	1		0	20%	6	20%	2
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR		0		0		0	60%	24		0
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		**32**		**2**		**0**		**56**		**8**
3	EBL		0		0		0				0
	EBT		0		0		0	80%	32		0
	EBR		0		0		0				0
	WBL		0		0		0				0
	WBT	80%	32	100%	2		0	80%	24	80%	8
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR		0		0		0				0
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		**32**		**2**		**0**		**56**		**8**
4	EBL		0		0		0				0
	EBT		0		0		0	80%	32		0
	EBR		0		0		0				0
	WBL	20%	8		0		0	20%	6	20%	2
	WBT	80%	32	100%	2		0	80%	24	80%	8
	WBR		0		0	100%	1				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR		0		0		0	20%	8		0
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		**40**		**2**		**1**		**70**		**10**
5	EBL		0		0		0				0
	EBT		0		0		0				0
	EBR		0		0		0	100%	40		0
	WBL		0		0		0				0
	WBT		0		0		0				0
	WBR		0		0		0				0
	NBL	50%	20	50%	1	100%	1	100%	30	100%	10
	NBT		0		0		0				0
	NBR		0		0		0				0
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR	50%	20	50%	1		0				0
	TEV		**40**		**2**		**1**		**70**		**10**
6	EBL		0		0		0				0
	EBT		0		0		0				0
	EBR		0		0		0				0
	WBL		0		0		0				0
	WBT		0		0		0				0
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT	50%	20	50%	1	100%	1	100%	30	100%	10
	NBR		0		0		0				0
	SBL		0		0		0				0
	SBT		0		0		0	100%	40		0
	SBR		0		0		0				0
	TEV		**20**		**1**		**1**		**70**		**10**
7	EBL		0		0		0				0
	EBT		0		0		0				0
	EBR		0		0		0				0
	WBL		0		0		0				0
	WBT		0		0		0				0
	WBR		0		0		0	100%	30		0
	NBL		0		0		0				0
	NBT	50%	20	50%	1	100%	1			100%	10
	NBR		0		0		0				0
	SBL		0		0		0	100%	40		0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		**20**		**1**		**1**		**70**		**10**

Node ID	Direction	Movement	2018 Kiewit Personal Veh. Distribution	2018 Kiewit Personal Veh. Trips	Added Trips: 2018 Added Trips Heavy Vehicles	Added Trips: 2018 Added Trips Single Occup. Vehicles	Added Trips: 2018 Added Trips TOTAL Site Trips	2018 TOTALS: 2018 TOTAL Summer Peak Unrounded Volumes	2018 TOTALS: 2018 TOTAL Summer Peak Rounded Volumes	2018 TOTALS: 2018 TOTAL Summer Peak Heavy Vehicle Volumes	2018 TOTALS: 2018 TOTAL Summer Peak HV %
				Trips: 100							
10		EBL		0	0	0	0	0	0	0	0.0%
10	EB	EBT		0	0	0	0	0	15	0	78.0%
10		EBR		0	0	0	0	0	0	0	0.0%
10		WBL	20%	20	15	22	37	37	40	15	40.5%
10	WB	WBT		0	0	0	0	0	15	0	82.0%
10		WBR		0	0	0	0	0	0	0	0.0%
10		NBL		0	0	0	0	0	0	0	0.0%
10	NB	NBT		0	0	0	0	0	0	0	0.0%
10		NBR		0	8	0	8	8	10	8	100.0%
10		SBL		0	0	0	0	0	0	0	0.0%
10	SB	SBT		0	0	0	0	0	0	0	0.0%
10		SBR		0	0	0	0	0	0	0	0.0%
	TEV			**20**	**23**	**22**	**45**	**45**	**80**	**23**	
20		EBL		0	0	0	0	0	0	0	0.0%
20	EB	EBT		0	8	0	8	18	20	16	88.9%
20		EBR		0	0	0	0	2	5	2	100.0%
20		WBL	60%	60	43	66	109	133	135	50	37.6%
20	WB	WBT	20%	20	15	22	37	48	50	24	50.0%
20		WBR		0	0	0	0	0	0	0	0.0%
20		NBL		0	0	0	0	4	5	4	100.0%
20	NB	NBT		0	0	0	0	0	0	0	0.0%
20		NBR		0	24	0	24	37	40	32	86.5%
20		SBL		0	0	0	0	0	0	0	0.0%
20	SB	SBT		0	0	0	0	0	0	0	0.0%
20		SBR		0	0	0	0	0	0	0	0.0%
	TEV			**80**	**90**	**88**	**178**	**242**	**255**	**128**	
30		EBL		0	0	0	0	0	0	0	0.0%
30	EB	EBT		0	32	0	32	55	55	47	85.5%
30		EBR		0	0	0	0	0	0	0	0.0%
30		WBL		0	0	0	0	0	0	0	0.0%
30	WB	WBT	80%	80	58	88	146	181	185	72	39.8%
30		WBR		0	0	0	0	0	0	0	0.0%
30		NBL		0	0	0	0	0	0	0	0.0%
30	NB	NBT		0	0	0	0	0	0	0	0.0%
30		NBR		0	0	0	0	0	0	0	0.0%
30		SBL		0	0	0	0	2	5	0	0.0%
30	SB	SBT		0	0	0	0	0	0	0	0.0%
30		SBR		0	0	0	0	0	0	0	0.0%
	TEV			**80**	**90**	**88**	**178**	**238**	**245**	**119**	
40		EBL		0	0	0	0	0	0	0	0.0%
40	EB	EBT		0	32	0	32	57	60	48	84.2%
40		EBR		0	0	0	0	0	0	0	0.0%
40		WBL	15%	15	14	17	31	31	35	14	45.2%
40	WB	WBT	60%	60	58	68	126	161	165	72	44.7%
40		WBR	25%	25	1	25	26	26	30	1	3.8%
40		NBL		0	0	0	0	0	0	0	0.0%
40	NB	NBT		0	0	0	0	0	0	0	0.0%
40		NBR		0	8	0	8	8	10	8	100.0%
40		SBL		0	0	0	0	0	0	0	0.0%
40	SB	SBT	5%	5	0	5	5	5	5	0	0.0%
40		SBR	20%	20	0	20	20	20	20	0	0.0%
	TEV			**125**	**113**	**135**	**248**	**308**	**325**	**143**	
50		EBL		0	0	0	0	7	10	7	100.0%
50	EB	EBT		0	0	0	0	0	0	0	0.0%
50		EBR		0	40	0	40	58	60	52	89.7%
50		WBL		0	0	0	0	0	0	0	0.0%
50	WB	WBT		0	0	0	0	0	0	0	0.0%
50		WBR		0	0	0	0	0	0	0	0.0%
50		NBL	100%	100	52	110	162	189	190	65	34.4%
50	NB	NBT		0	0	0	0	151	155	23	15.2%
50		NBR		0	0	0	0	0	0	0	0.0%
50		SBL		0	0	0	0	0	0	0	0.0%
50	SB	SBT		0	0	0	0	210	210	44	21.0%
50		SBR		0	21	0	21	29	30	23	79.3%
	TEV			**100**	**113**	**110**	**223**	**644**	**655**	**214**	
60		EBL		0	0	0	0	0	0	0	0.0%
60	EB	EBT		0	0	0	0	0	0	0	0.0%
60		EBR		0	0	0	0	0	0	0	0.0%
60		WBL		0	0	0	0	58	60	5	8.6%
60	WB	WBT		0	0	0	0	0	0	0	0.0%
60		WBR		0	0	0	0	10	10	1	10.0%
60		NBL		0	0	0	0	0	0	0	0.0%
60	NB	NBT	100%	100	52	110	162	349	350	89	25.5%
60		NBR		0	0	0	0	14	15	2	14.3%
60		SBL		0	0	0	0	4	5	0	0.0%
60	SB	SBT		0	40	0	40	295	295	97	32.9%
60		SBR		0	0	0	0	0	0	0	0.0%
	TEV			**100**	**92**	**110**	**202**	**730**	**735**	**194**	
70		EBL		0	0	0	0	0	0	0	0.0%
70	EB	EBT		0	0	0	0	0	0	0	0.0%
70		EBR		0	0	0	0	0	0	0	0.0%
70		WBL		0	0	0	0	4	5	0	0.0%
70	WB	WBT		0	0	0	0	0	0	0	0.0%
70		WBR	100%	100	30	100	130	134	135	31	23.1%
70		NBL		0	0	0	0	0	0	0	0.0%
70	NB	NBT		0	22	10	32	229	230	55	24.0%
70		NBR		0	0	0	0	9	10	0	0.0%
70		SBL		0	40	0	40	44	45	40	90.9%
70	SB	SBT		0	0	0	0	309	310	58	18.8%
70		SBR		0	0	0	0	0	0	0	0.0%
	TEV			**100**	**92**	**110**	**202**	**729**	**735**	**184**	

Node ID	Direction	Movement	EFSC Only Added Trips: 2018 EFSC Deliveries Distribution	EFSC Only Added Trips: 2018 EFSC Deliveries Trips	EFSC Only Added Trips: 2018 EFSC Bus Transp. Distribution	EFSC Only Added Trips: 2018 EFSC Bus Transp. Trips	EFSC Only Added Trips: 2018 EFSC Security Distribution	EFSC Only Added Trips: 2018 EFSC Security Trips	EFSC Only Added Trips: 2018 EFSC Personal Veh. Distribution	EFSC Only Added Trips: 2018 EFSC Personal Veh. Trips	2018 EFSC TOTAL Summer Peak ADDED Trips	2018 EFSC TOTALS: 2018 EFSC TOTAL Summer Peak Trips	2018 EFSC TOTALS: 2018 EFSC TOTAL Summer Peak HV Trips	2018 EFSC TOTALS: 2018 EFSC TOTAL Summer Peak HV %
				Trips: 14		Trips EXIT Housing: 12 Trips ENTER Housing: 12		Trips: 4		Trips: 34				
10		EBL		0				0		0	0	0	0	0.0%
10	EB	EBT		0				0		0	0	0	0	0.0%
10		EBR		0				0		0	0	0	0	0.0%
10		WBL		0				0		0	0	0	0	0.0%
10	WB	WBT		0				0		0	0	0	0	0.0%
10		WBR		0				0		0	0	0	0	0.0%
10		NBL		0				0		0	0	0	0	0.0%
10	NB	NBT		0				0		0	0	0	0	0.0%
10		NBR		0				0		0	0	0	0	0.0%
10		SBL		0				0		0	0	0	0	0.0%
10	SB	SBT		0				0		0	0	0	0	0.0%
10		SBR		0				0		0	0	0	0	0.0%
	TEV			**0**		**0**		**0**		**0**	**0**	**0**	**0**	
20		EBL		0				0		0	0	0	0	0.0%
20	EB	EBT		0				0		0	0	10	8	80.0%
20		EBR		0				0		0	0	2	2	100.0%
20		WBL		0				0		0	0	24	7	29.2%
20	WB	WBT		0				0		0	0	11	9	81.8%
20		WBR		0				0		0	0	0	0	0.0%
20		NBL		0				0		0	0	4	4	100.0%
20	NB	NBT		0				0		0	0	0	0	0.0%
20		NBR		0				0		0	0	13	8	61.5%
20		SBL		0				0		0	0	0	0	0.0%
20	SB	SBT		0				0		0	0	0	0	0.0%
20		SBR		0				0		0	0	0	0	0.0%
	TEV			**0**		**0**		**0**		**0**	**0**	**64**	**38**	
30		EBL		0				0		0	0	0	0	0.0%
30	EB	EBT		0				0		0	0	23	15	65.2%
30		EBR		0				0		0	0	0	0	0.0%
30		WBL		0				0		0	0	0	0	0.0%
30	WB	WBT		0				0		0	0	35	14	40.0%
30		WBR		0				0		0	0	0	0	0.0%
30		NBL		0				0		0	0	0	0	0.0%
30	NB	NBT		0				0		0	0	0	0	0.0%
30		NBR		0				0		0	0	0	0	0.0%
30		SBL		0				0		0	0	2	0	0.0%
30	SB	SBT		0				0		0	0	0	0	0.0%
30		SBR		0				0		0	0	0	0	0.0%
	TEV			**0**		**0**		**0**		**0**	**0**	**60**	**29**	
40		EBL		0				0		0	0	0	0	0.0%
40	EB	EBT		0				0		0	0	25	16	64.0%
40		EBR		0				0		0	0	0	0	0.0%
40		WBL	100%	14	100%	12	100%	4	75%	26	56	56	26	46.4%
40	WB	WBT		0				0		0	0	35	14	40.0%
40		WBR		0				0	25%	9	9	9	0	0.0%
40		NBL		0				0		0	0	0	0	0.0%
40	NB	NBT		0				0		0	0	0	0	0.0%
40		NBR		0	100%	12		0		0	12	12	12	100.0%
40		SBL		0				0		0	0	0	0	0.0%
40	SB	SBT		0				0	25%	9	9	9	0	0.0%
40		SBR		0				0		0	0	0	0	0.0%
	TEV			**14**		**24**		**4**		**44**	**86**	**146**	**68**	
50		EBL		0				0		0	0	7	7	100.0%
50	EB	EBT		0				0		0	0	0	0	0.0%
50		EBR		0	100%	12		0		0	12	30	24	80.0%
50		WBL		0				0		0	0	0	0	0.0%
50	WB	WBT		0				0		0	0	0	0	0.0%
50		WBR		0				0		0	0	0	0	0.0%
50		NBL	50%	7	100%	12	100%	4	100%	34	57	84	32	38.1%
50	NB	NBT		0				0		0	0	151	23	15.2%
50		NBR		0				0		0	0	0	0	0.0%
50		SBL		0				0		0	0	0	0	0.0%
50	SB	SBT		0				0		0	0	210	44	21.0%
50		SBR	50%	7				0		0	7	15	9	60.0%
	TEV			**14**		**24**		**4**		**34**	**76**	**497**	**139**	
60		EBL		0				0		0	0	0	0	0.0%
60	EB	EBT		0				0		0	0	0	0	0.0%
60		EBR		0				0		0	0	0	0	0.0%
60		WBL		0				0		0	0	58	5	8.6%
60	WB	WBT		0				0		0	0	0	0	0.0%
60		WBR		0				0		0	0	10	1	10.0%
60		NBL		0				0		0	0	0	0	0.0%
60	NB	NBT	50%	7	100%	12	100%	4	100%	34	57	244	56	23.0%
60		NBR		0				0		0	0	14	2	14.3%
60		SBL		0				0		0	0	4	0	0.0%
60	SB	SBT		0	100%	12		0		0	12	267	69	25.8%
60		SBR		0				0		0	0	0	0	0.0%
	TEV			**7**		**24**		**4**		**34**	**69**	**597**	**133**	
70		EBL		0				0		0	0	0	0	0.0%
70	EB	EBT		0				0		0	0	0	0	0.0%
70		EBR		0				0		0	0	0	0	0.0%
70		WBL		0				0		0	0	4	0	0.0%
70	WB	WBT		0				0		0	0	0	0	0.0%
70		WBR		0	100%	12	100%	4	100%	34	50	54	13	24.1%
70		NBL		0				0		0	0	0	0	0.0%
70	NB	NBT	50%	7				0		0	7	204	40	19.6%
70		NBR		0				0		0	0	9	0	0.0%
70		SBL		0	100%	12		0		0	12	16	12	75.0%
70	SB	SBT		0				0		0	0	309	58	18.8%
70		SBR		0				0		0	0	0	0	0.0%
	TEV			**7**		**24**		**4**		**34**	**69**	**596**	**123**	

Project: Jordan Cove TIA Update
Job #: JCEP00000-007
Subject: *PM 2014 Turning Movement Volumes*
Created: 8/29/2014
Rev. Date: 9/23/2014

Growth: Years 4; Rate 0.80%

% Trips coming from worksite
% Trips going to worksite

Kiewit Delivery Trips: 40; Kiewit Water/Sewer Trips: 2; Kiewit Office Supplies Trips: 1; Trips EXIT Housing: 40; Trips ENTER Housing: 40; Security Trips: 10

Int No.	Synchro ID	Intersection	Node ID	Direction	Movement	2014 Turning Movement Count Data: 2014 Existing Turning Mvt. Counts	2014 Existing Heavy Vehicle Counts	2014 Existing HV %	2014 Existing: 2014 Existing Unrounded Volumes	2014 Existing Balancing Adjustments	2014 Existing Unrounded Balanced Volumes	Future Background: 2018 Future Back. Unrounded Volumes	2018 Future Back. Balancing Adjustments	2018 Future Back. Unrounded Balanced Volumes	2018 Future Back. Rounded Balanced Volumes
1	10	Transpacific Parkway @ Entrance A	10		EBL	0	0	0.0%	0		0	0		0	0
	10		10	EB	EBT	0	0	0.0%	0		0	0		0	0
	10	Count Date:	10		EBR	0	0	0.0%	0		0	0		0	0
	10	2014	10		WBL	0	0	0.0%	0		0	0		0	0
	10		10	WB	WBT	0	0	0.0%	0		0	0		0	0
	10		10		WBR	0	0	0.0%	0		0	0		0	0
	10		10		NBL	0	0	0.0%	0		0	0		0	0
	10	PM Peak Hour Used: 4:30PM - 5:30PM	10	NB	NBT	0	0	0.0%	0		0	0		0	0
	10	Existing PHF:	10		NBR	0	0	0.0%	0		0	0		0	0
	10	0	10		SBL	0	0	0.0%	0		0	0		0	0
	10		10	SB	SBT	0	0	0.0%	0		0	0		0	0
	10		10		SBR	0	0	0.0%	0		0	0		0	0
				TEV		0	0		0		0	0		0	0
2	20	Transpacific Parkway @ Entrance C (Jordan Cove Rd)	20		EBL	0	0	0.0%	0		0	0		0	0
	20		20	EB	EBT	55	3	5.5%	55		55	57	1	58	60
	20	Count Date: 8/12/2014	20		EBR	0	0	0.0%	0		0	0		0	0
	20	2014	20		WBL	13	5	38.5%	13		13	14		14	15
	20		20	WB	WBT	13	1	7.7%	13		13	14		14	15
	20		20		WBR	0	0	0.0%	0		0	0		0	0
	20		20		NBL	1	1	100.0%	1		1	2		2	5
	20	PM Peak Hour Used: 4:30PM - 5:30PM	20	NB	NBT	0	0	0.0%	0		0	0		0	0
	20	Existing PHF:	20		NBR	23	6	26.1%	23		23	24	1	25	25
	20	0.66	20		SBL	0	0	0.0%	0		0	0		0	0
	20		20	SB	SBT	0	0	0.0%	0		0	0		0	0
	20		20		SBR	0	0	0.0%	0		0	0		0	0
				TEV		105	16		105		105	111		113	120
3	30	Transpacific Parkway @ Horsfall Beach Rd	30		EBL	2	0	0.0%	2		2	3		3	5
	30		30	EB	EBT	79	9	11.4%	79	(3)	76	79	1	80	80
	30	Count Date: 8/13/2014	30		EBR	0	0	0.0%	0		0	0		0	0
	30	2014	30		WBL	0	0	0.0%	0		0	0		0	0
	30		30	WB	WBT	28	5	17.9%	28	(2)	26	27	1	28	30
	30		30		WBR	21	0	0.0%	21	2	23	24	1	25	25
	30		30		NBL	0	0	0.0%	0		0	0		0	0
	30	PM Peak Hour Used: 4:30PM - 5:30PM	30	NB	NBT	0	0	0.0%	0		0	0		0	0
	30	Existing PHF:	30		NBR	0	0	0.0%	0		0	0		0	0
	30	0.70	30		SBL	15	3	20.0%	15	2	17	18		18	20
	30		30	SB	SBT	0	0	0.0%	0		0	0		0	0
	30		30		SBR	0	0	0.0%	0		0	0		0	0
				TEV		145	17		145		144	151		154	160
4	40	Transpacific Parkway @ Entrance D (Boxcar Hill)	40		EBL	1	0	0.0%	1		1	2		2	5
	40		40	EB	EBT	91	12	13.2%	91		91	94		94	95
	40	Count Date: 8/12/2014	40		EBR	1	0	0.0%	1		1	2		2	5
	40	2014	40		WBL	0	0	0.0%	0		0	0		0	0
	40		40	WB	WBT	45	5	11.1%	45		45	47		47	50
	40		40		WBR	10	3	30.0%	10		10	11		11	15
	40		40		NBL	1	0	0.0%	1		1	2		2	5
	40	PM Peak Hour Used: 4:30PM - 5:30PM	40	NB	NBT	0	0	0.0%	0		0	0		0	0
	40	Existing PHF:	40		NBR	2	0	0.0%	2		2	3		3	5
	40	0.72	40		SBL	7	2	28.6%	7		7	8		8	10
	40		40	SB	SBT	0	0	0.0%	0		0	0		0	0
	40		40		SBR	3	0	0.0%	3		3	4		4	5
				TEV		161	22		161		161	173		173	195
5	50	Transpacific Parkway @ US 101	50		EBL	16	1	6.3%	16		16	17		17	20
	50		50	EB	EBT	0	0	0.0%	0		0	0		0	0
	50	Count Date: 8/12/2014	50		EBR	83	11	13.3%	83	1	84	87	1	88	90
	50	2014	50		WBL	0	0	0.0%	0		0	0		0	0
	50		50	WB	WBT	0	0	0.0%	0		0	0		0	0
	50		50		WBR	0	0	0.0%	0		0	0		0	0
	50		50		NBL	39	8	20.5%	39	1	40	42		42	45
	50	PM Peak Hour Used: 4:30PM - 5:30PM	50	NB	NBT	576	36	6.3%	576		576	595		595	595
	50	Existing PHF:	50		NBR	0	0	0.0%	0		0	0		0	0
	50	0.97	50		SBL	0	0	0.0%	0		0	0		0	0
	50		50	SB	SBT	494	31	6.3%	494		494	510		510	510
	50		50		SBR	13	2	15.4%	13	2	15	16		16	20
				TEV		1221	89		1221		1225	1267		1268	1280
6	60	US 101 @ East Bay Rd	60		EBL	0	0	0.0%	0		0	0		0	0
	60		60	EB	EBT	0	0	0.0%	0		0	0		0	0
	60	Count Date: 8/12/2014	60		EBR	0	0	0.0%	0		0	0		0	0
	60	2014	60		WBL	39	1	2.6%	39		39	41		41	45
	60		60	WB	WBT	0	0	0.0%	0		0	0		0	0
	60		60		WBR	15	0	0.0%	15		15	16		16	20
	60		60		NBL	0	0	0.0%	0		0	0		0	0
	60	PM Peak Hour Used: 4:30PM - 5:30PM	60	NB	NBT	675	44	6.5%	675	5	680	702	1	703	705
	60	Existing PHF:	60		NBR	111	4	3.6%	111	3	114	118		118	120
	60	0.97	60		SBL	18	1	5.6%	18		18	19		19	20
	60		60	SB	SBT	612	45	7.4%	612		612	632		632	635
	60		60		SBR	0	0	0.0%	0		0	0		0	0
				TEV		1470	95		1470		1478	1528		1529	1545
7	70	US 101 @ Ferry Rd	70		EBL	0	0	0.0%	0		0	0		0	0
	70		70	EB	EBT	0	0	0.0%	0		0	0		0	0
	70	Count Date: 8/12/2014	70		EBR	0	0	0.0%	0		0	0		0	0
	70	2014	70		WBL	7	0	0.0%	7		7	8		8	10
	70		70	WB	WBT	0	0	0.0%	0		0	0		0	0
	70		70		WBR	3	0	0.0%	3		3	4		4	5
	70		70		NBL	0	0	0.0%	0		0	0		0	0
	70	PM Peak Hour Used: 4:30PM - 5:30PM	70	NB	NBT	791	34	4.3%	791		791	817		817	820
	70	Existing PHF:	70		NBR	20	0	0.0%	20		20	21		21	25
	70	0.96	70		SBL	3	0	0.0%	3	2	5	6		6	10
	70		70	SB	SBT	637	40	6.3%	637	9	646	667		667	670
	70		70		SBR	0	0	0.0%	0		0	0		0	0
				TEV		1461	74		1461		1472	1523		1523	1540

2018 Construction Trips

Int No.	Movement	2018 Kiewit Delivery Distribution	2018 Kiewit Delivery Trips	2018 Kiewit Water/Sewer Distribution	2018 Kiewit Water/Sewer Trips	2018 Kiewit Office Supplies Distribution	2018 Kiewit Office Supplies Trips	2018 Kiewit Bus Transp. Distribution	2018 Kiewit Bus Transp. Trips	2018 Security Distribution	2018 Security Trips
1	EBL		0		0		0				0
	EBT		0		0		0				0
	EBR		0		0		0				0
	WBL		0		0		0	20%	8		0
	WBT		0		0		0				0
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR	20%	8	50%	1		0	20%	8	20%	2
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		8		1		0		16		2
2	EBL		0		0		0				0
	EBT	20%	8	50%	1		0	20%	8	20%	2
	EBR		0		0		0				0
	WBL		0		0		0	60%	24		0
	WBT		0		0		0	20%	8		0
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR	60%	24	50%	1		0	60%	24	60%	6
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		32		2		0		64		8
3	EBL		0		0		0				0
	EBT	80%	32	100%	2		0	80%	32	80%	8
	EBR		0		0		0				0
	WBL		0		0		0				0
	WBT		0		0		0	80%	32		0
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR		0		0		0				0
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		32		2		0		64		8
4	EBL		0		0		0				0
	EBT	80%	32	100%	2		0	80%	32	80%	8
	EBR		0		0		0				0
	WBL		0		0		0	20%	8		0
	WBT		0		0		0	80%	32		0
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR	20%	8		0		0	20%	8	20%	2
	SBL		0		0	100%	1				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		40		2		1		80		10
5	EBL	50%	20	50%	1		0				0
	EBT		0		0		0				0
	EBR	50%	20	50%	1	100%	1	100%	40	100%	10
	WBL		0		0		0				0
	WBT		0		0		0				0
	WBR		0		0		0				0
	NBL		0		0		0	100%	40		0
	NBT		0		0		0				0
	NBR		0		0		0				0
	SBL		0		0		0				0
	SBT		0		0		0				0
	SBR		0		0		0				0
	TEV		40		2		1		80		10
6	EBL		0		0		0				0
	EBT		0		0		0				0
	EBR		0		0		0				0
	WBL		0		0		0				0
	WBT		0		0		0				0
	WBR		0		0		0				0
	NBL		0		0		0				0
	NBT		0		0		0	100%	40		0
	NBR		0		0		0				0
	SBL		0		0		0				0
	SBT	50%	20	50%	1	100%	1	100%	40	100%	10
	SBR		0		0		0				0
	TEV		20		1		1		80		10
7	EBL		0		0		0				0
	EBT		0		0		0				0
	EBR		0		0		0				0
	WBL		0		0		0				0
	WBT		0		0		0				0
	WBR		0		0		0	100%	40		0
	NBL		0		0		0				0
	NBT		0		0		0				0
	NBR		0		0		0				0
	SBL		0		0		0	100%	40		0
	SBT	50%	20	50%	1	100%	1			100%	10
	SBR		0		0		0				0
	TEV		20		1		1		80		10

Kiewit Personal Veh. Trips: 150 · EFSC Deliveries Trips: 14 · EFSC Bus Transp. Trips EXIT Housing: 13 · Trips ENTER Housing: 14 · EFSC Security Trips: 4 · EFSC Personal Veh. Trips: 50

					Added Trips			2018 TOTALS				EFSC Only Added Trips									2018 EFSC TOTALS		
			2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018	2018
Node ID	Direction	Movement	Kiewit Personal Veh. Distribution	Kiewit Personal Veh. Trips	Added Trips Heavy Vehicles	Added Trips Single Occup. Vehicles	Added Trips TOTAL Site Trips	TOTAL Summer Peak Unrounded Volumes	TOTAL Summer Peak Rounded Volumes	TOTAL Summer Peak Heavy Vehicle Volumes	TOTAL Summer Peak HV %	EFSC Deliveries Distribution	EFSC Deliveries Trips	EFSC Bus Transp. Distribution	EFSC Bus Transp. Trips	EFSC Security Distribution	EFSC Security Trips	EFSC Personal Veh. Distribution	EFSC Personal Veh. Trips	EFSC TOTAL Summer Peak ADDED Trips	EFSC TOTAL Summer Peak Trips	EFSC TOTAL Summer Peak HV Trips	EFSC TOTAL Summer Peak HV %
10		EBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
10	EB	EBT		0	0	0	0	0	60	0	6.0%		0				0		0	0	0	0	0.0%
10		EBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
10		WBL		0	8	0	8	8	10	8	100.0%		0				0		0	0	0	0	0.0%
10	WB	WBT		0	0	0	0	0	20	0	8.0%		0				0		0	0	0	0	0.0%
10		WBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
10		NBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
10	NB	NBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
10		NBR	20%	30	17	32	49	49	50	17	34.7%		0				0		0	0	0	0	0.0%
10		SBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
10	SB	SBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
10		SBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
	TEV			30	25	32	57	57	140	25			0		0		0		0	0	0	0	
20		EBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
20	EB	EBT	20%	30	17	32	49	107	110	20	18.7%		0				0		0	0	58	3	5.2%
20		EBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
20		WBL		0	24	0	24	38	40	29	76.3%		0				0		0	0	14	5	35.7%
20	WB	WBT		0	8	0	8	22	25	9	40.9%		0				0		0	0	14	1	7.1%
20		WBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
20		NBL		0	0	0	0	2	5	2	100.0%		0				0		0	0	2	2	100.0%
20	NB	NBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
20		NBR	60%	90	49	96	145	170	170	56	32.9%		0				0		0	0	25	7	28.0%
20		SBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
20	SB	SBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
20		SBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
	TEV			120	98	128	226	339	350	116			0		0		0		0	0	113	18	
30		EBL		0	0	0	0	3	5	0	0.0%		0				0		0	0	3	0	0.0%
30	EB	EBT	80%	120	66	128	194	274	275	75	27.4%		0				0		0	0	80	9	11.3%
30		EBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
30		WBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
30	WB	WBT		0	32	0	32	60	60	37	61.7%		0				0		0	0	28	5	17.9%
30		WBR		0	0	0	0	25	25	0	0.0%		0				0		0	0	25	0	0.0%
30		NBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
30	NB	NBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
30		NBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
30		SBL		0	0	0	0	18	20	4	22.2%		0				0		0	0	18	4	22.2%
30	SB	SBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
30		SBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
	TEV			120	98	128	226	380	385	116			0		0		0		0	0	154	18	
40		EBL	20%	30	0	30	30	32	35	0	0.0%		0				0		0	0	2	0	0.0%
40	EB	EBT	60%	90	66	98	164	258	260	78	30.2%		0				0		0	0	94	12	12.8%
40		EBR		0	0	0	0	2	5	0	0.0%		0				0		0	0	2	0	0.0%
40		WBL		0	8	0	8	8	10	8	100.0%		0	100%	13		0		0	13	13	13	100.0%
40	WB	WBT		0	32	0	32	79	80	37	46.8%		0				0		0	0	47	5	10.6%
40		WBR		0	0	0	0	11	15	3	27.3%		0				0		0	0	11	3	27.3%
40		NBL		0	0	0	0	2	5	0	0.0%		0				0		0	0	2	0	0.0%
40	NB	NBT	5%	8	0	8	8	8	10	0	0.0%		0				0	25%	13	13	13	0	0.0%
40		NBR	15%	23	16	25	41	44	45	16	36.4%	100%	14	100%	14	100%	4	75%	38	70	73	28	38.4%
40		SBL	25%	38	1	38	39	47	50	3	6.4%		0				0	25%	13	13	21	2	9.5%
40	SB	SBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
40		SBR		0	0	0	0	4	5	0	0.0%		0				0		0	0	4	0	0.0%
	TEV			189	123	199	322	495	520	145			14		27		4		64	109	282	63	
50		EBL		0	21	0	21	38	40	22	57.9%	50%	7				0		0	7	24	8	33.3%
50	EB	EBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
50		EBR	100%	150	62	160	222	310	310	74	23.9%	50%	7	100%	14	100%	4	100%	50	75	163	33	20.2%
50		WBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
50	WB	WBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
50		WBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
50		NBL		0	40	0	40	82	85	49	59.8%		0	100%	13		0		0	13	55	22	40.0%
50	NB	NBT		0	0	0	0	595	595	37	6.2%		0				0		0	0	595	37	6.2%
50		NBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
50		SBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
50	SB	SBT		0	0	0	0	510	510	32	6.3%		0				0		0	0	510	32	6.3%
50		SBR		0	0	0	0	16	20	2	12.5%		0				0		0	0	16	2	12.5%
	TEV			150	123	160	283	1551	1560	216			14		27		4		50	95	1363	134	
60		EBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
60	EB	EBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
60		EBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
60		WBL		0	0	0	0	41	45	1	2.4%		0				0		0	0	41	1	2.4%
60	WB	WBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
60		WBR		0	0	0	0	16	20	0	0.0%		0				0		0	0	16	0	0.0%
60		NBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
60	NB	NBT		0	40	0	40	743	745	86	11.6%		0	100%	13		0		0	13	716	59	8.2%
60		NBR		0	0	0	0	118	120	4	3.4%		0				0		0	0	118	4	3.4%
60		SBL		0	0	0	0	19	20	1	5.3%		0				0		0	0	19	1	5.3%
60	SB	SBT	100%	150	62	160	222	854	855	108	12.6%	50%	7	100%	14	100%	4	100%	50	75	707	67	9.5%
60		SBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
	TEV			150	102	160	262	1791	1805	200			7		27		4		50	88	1617	132	
70		EBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
70	EB	EBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
70		EBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
70		WBL		0	0	0	0	8	10	0	0.0%		0				0		0	0	8	0	0.0%
70	WB	WBT		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
70		WBR		0	40	0	40	44	45	40	90.9%		0	100%	13		0		0	13	17	13	76.5%
70		NBL		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
70	NB	NBT		0	0	0	0	817	820	35	4.3%		0				0		0	0	817	35	4.3%
70		NBR		0	0	0	0	21	25	0	0.0%		0				0		0	0	21	0	0.0%
70		SBL	100%	150	40	150	190	196	200	40	20.4%		0	100%	14	100%	4	100%	50	68	74	14	18.9%
70	SB	SBT		0	22	10	32	699	700	64	9.2%	50%	7				0		0	7	674	49	7.3%
70		SBR		0	0	0	0	0	0	0	0.0%		0				0		0	0	0	0	0.0%
	TEV			150	102	160	262	1785	1800	179			7		27		4		50	88	1611	111	

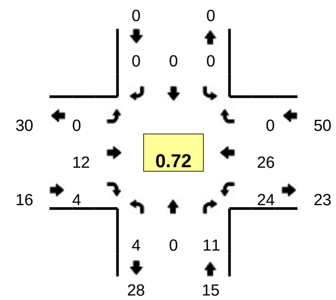
Appendix B – Traffic Count Data

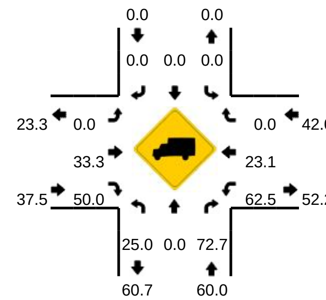
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

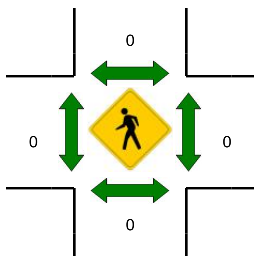
LOCATION: Jordan Cove Rd -- Trans Pacific Ln — **QC JOB #:** 12764711

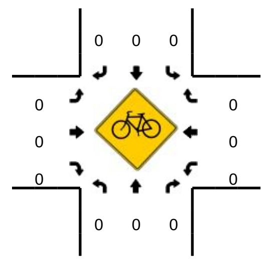
CITY/STATE: Coos County, OR — **DATE:** Wed, Aug 13 2014

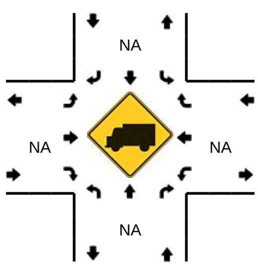
Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:45 AM -- 9:00 AM

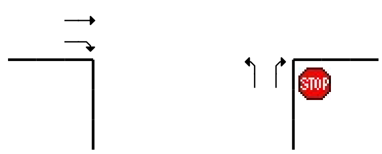


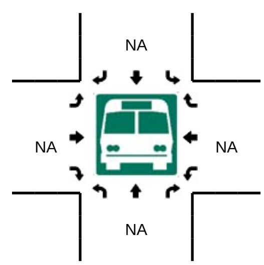












5-Min Count Period Beginning At	Jordan Cove Rd (Northbound) Left	Thru	Right	U	Jordan Cove Rd (Southbound) Left	Thru	Right	U	Trans Pacific Ln (Eastbound) Left	Thru	Right	U	Trans Pacific Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	4	54
7:05 AM	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0	0	5	58
7:10 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	57
7:15 AM	0	0	1	0	0	0	0	0	0	0	0	0	0	4	0	0	5	60
7:20 AM	0	0	0	0	0	0	0	0	0	1	1	0	2	3	0	0	7	64
7:25 AM	0	0	0	0	0	0	0	0	0	1	0	0	6	3	0	0	10	65
7:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	2	2	0	0	5	65
7:35 AM	0	0	1	0	0	0	0	0	0	1	0	0	1	2	0	0	5	66
7:40 AM	0	0	1	0	0	0	0	0	0	1	0	0	0	3	0	0	5	66
7:45 AM	1	0	2	0	0	0	0	0	0	0	0	0	1	4	0	0	8	71
7:50 AM	0	0	1	0	0	0	0	0	0	2	0	0	1	4	0	0	8	70
7:55 AM	0	0	2	0	0	0	0	0	0	1	0	0	0	3	0	0	6	70
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66
8:05 AM	1	0	2	0	0	0	0	0	0	1	0	0	3	1	0	0	8	69
8:10 AM	0	0	1	0	0	0	0	0	0	0	0	0	2	1	0	0	4	71
8:15 AM	0	0	0	0	0	0	0	0	0	0	1	0	2	2	0	0	5	71
8:20 AM	1	0	2	0	0	0	0	0	0	3	0	0	0	2	0	0	8	72
8:25 AM	0	0	2	0	0	0	0	0	0	0	0	0	3	6	0	0	11	73
8:30 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	0	3	71
8:35 AM	1	0	1	0	0	0	0	0	0	1	1	0	3	1	0	0	8	74
8:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	4	0	0	6	75
8:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	3	4	0	0	8	75
8:50 AM	1	0	1	0	0	0	0	0	0	2	0	0	2	2	0	0	8	75
8:55 AM	0	0	2	0	0	0	0	0	0	3	2	0	4	1	0	0	12	81

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	4	0	12	0	0	0	0	0	0	24	8	0	36	28	0	0	112
Heavy Trucks	0	0	4		0	0	0		0	4	4		32	4	0		48
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

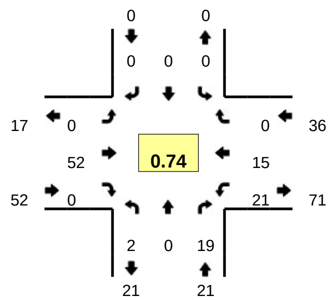
Comments:

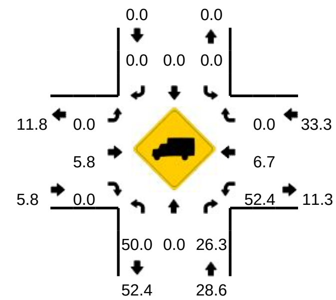
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

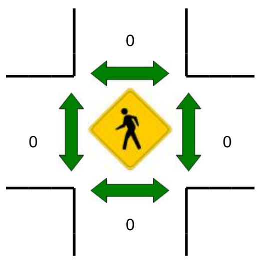
LOCATION: Jordan Cove Rd -- Trans Pacific Ln | **QC JOB #:** 12764712

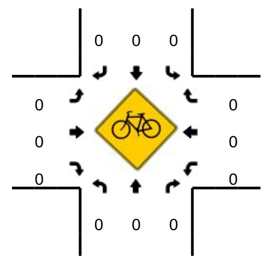
CITY/STATE: Coos County, OR | **DATE:** Tue, Aug 12 2014

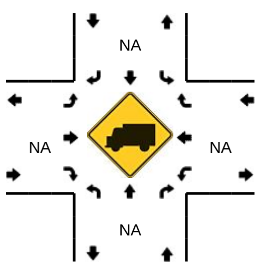
Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

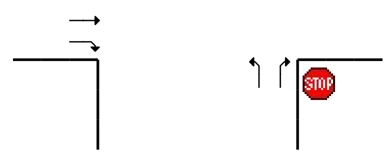


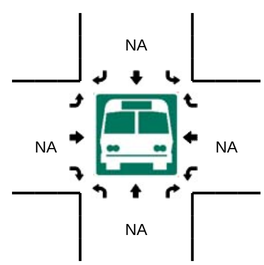












5-Min Count Period Beginning At	Jordan Cove Rd (Northbound) Left	Thru	Right	U	Jordan Cove Rd (Southbound) Left	Thru	Right	U	Trans Pacific Ln (Eastbound) Left	Thru	Right	U	Trans Pacific Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
3:40 PM	0	0	0	0	0	0	0	0	0	5	0	0	0	2	0	0	7	89
3:45 PM	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2	81
3:50 PM	0	0	1	0	0	0	0	0	0	5	0	0	4	1	0	0	11	89
3:55 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	2	0	0	4	86
4:00 PM	0	0	0	0	0	0	0	0	0	5	0	0	1	1	0	0	7	90
4:05 PM	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2	87
4:10 PM	0	0	2	0	0	0	0	0	0	6	0	0	0	1	0	0	9	91
4:15 PM	0	0	1	0	0	0	0	0	0	0	0	0	4	0	0	0	5	94
4:20 PM	0	0	0	0	0	0	0	0	0	2	0	0	3	2	0	0	7	94
4:25 PM	1	0	1	0	0	0	0	0	0	3	0	0	1	3	0	0	9	95
4:30 PM	0	0	2	0	0	0	0	0	0	5	0	0	2	1	0	0	10	92
4:35 PM	1	0	2	0	0	0	0	0	0	12	0	0	0	1	0	0	16	89
4:40 PM	0	0	1	0	0	0	0	0	0	9	0	0	3	1	0	0	14	96
4:45 PM	0	0	3	0	0	0	0	0	0	4	0	0	0	0	0	0	7	101
4:50 PM	0	0	1	0	0	0	0	0	0	3	0	0	2	2	0	0	8	98
4:55 PM	0	0	2	0	0	0	0	0	0	1	0	0	1	2	0	0	6	100
5:00 PM	0	0	3	0	0	0	0	0	0	1	0	0	4	1	0	0	9	102
5:05 PM	0	0	1	0	0	0	0	0	0	6	0	0	1	1	0	0	9	109
5:10 PM	0	0	5	0	0	0	0	0	0	4	0	0	0	1	0	0	10	110
5:15 PM	0	0	1	0	0	0	0	0	0	6	0	0	0	1	0	0	8	113
5:20 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	0	0	4	110
5:25 PM	0	0	2	0	0	0	0	0	0	1	0	0	0	1	0	0	4	105
5:30 PM	0	0	3	0	0	0	0	0	0	1	0	0	0	0	0	0	4	99
5:35 PM	0	0	3	0	0	0	0	0	0	0	1	0	3	2	0	0	9	92

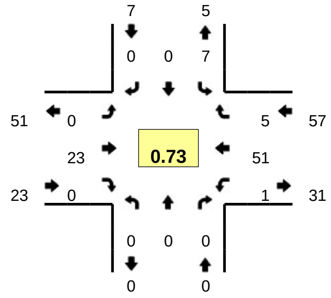
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	4	0	24	0	0	0	0	0	0	100	0	0	12	8	0	0	148
Heavy Trucks	4	0	8		0	0	0		0	4	0		4	0	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

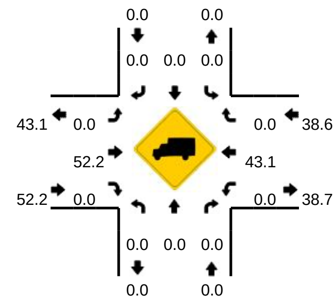
Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

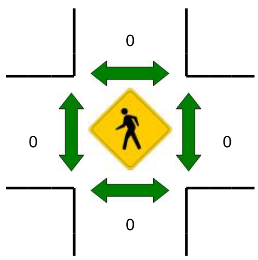
LOCATION: Horsfall Beach Rd -- Trans Pacific Ln — **QC JOB #:** 12764709

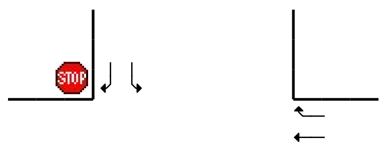
CITY/STATE: Coos County, OR — **DATE:** Wed, Aug 13 2014

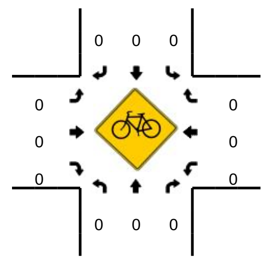


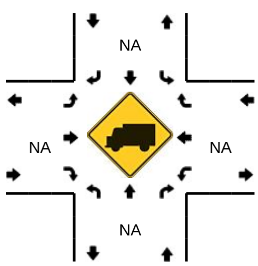
Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:45 AM -- 9:00 AM

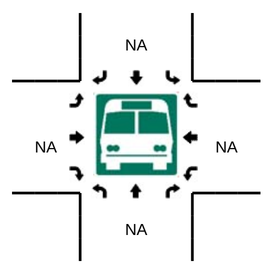












5-Min Count Period Beginning At	Horsfall Beach Rd (Northbound) Left	Thru	Right	U	Horsfall Beach Rd (Southbound) Left	Thru	Right	U	Trans Pacific Ln (Eastbound) Left	Thru	Right	U	Trans Pacific Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	4	52
7:05 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	1	0	0	6	57
7:10 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	56
7:15 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	3	0	0	5	59
7:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6	62
7:25 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	9	1	0	12	65
7:30 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	4	0	0	6	67
7:35 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	1	0	6	70
7:40 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	4	1	0	7	73
7:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	4	1	0	6	71
7:50 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	5	0	0	9	74
7:55 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	5	74
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	71
8:05 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	6	0	1	10	75
8:10 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	2	75
8:15 AM	0	0	0	0	1	0	0	0	0	0	0	0	0	5	0	0	6	76
8:20 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	4	1	0	10	80
8:25 AM	0	0	0	0	1	0	0	0	0	2	0	0	0	6	0	0	9	77
8:30 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	2	0	0	4	75
8:35 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	7	0	0	9	78
8:40 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	6	77
8:45 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	9	1	0	12	83
8:50 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	5	0	0	7	81
8:55 AM	0	0	0	0	2	0	0	0	0	6	0	0	0	3	0	0	11	87

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	0	0	12	0	0	0	0	36	0	0	0	68	4	0	120
Heavy Trucks	0	0	0		0	0	0		0	8	0		0	40	0		48
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

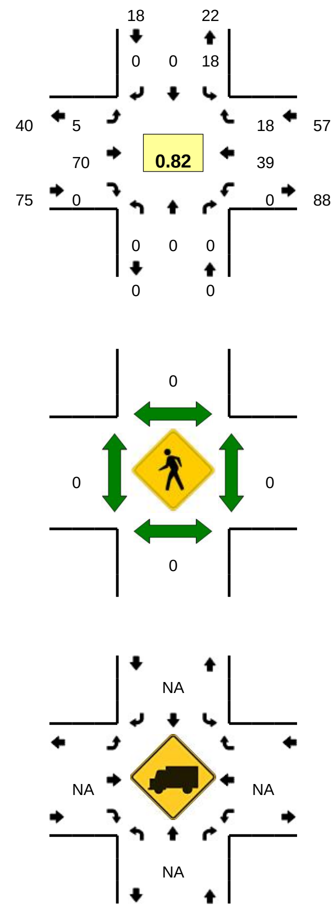
Comments:

Report generated on 8/18/2014 11:02 AM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: System Peak Method for determining peak hour: Total Entering Volume

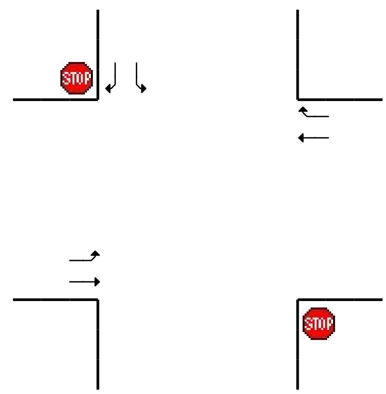
LOCATION: Horsfall Beach Rd -- Trans Pacific Ln **QC JOB #:** 12764710

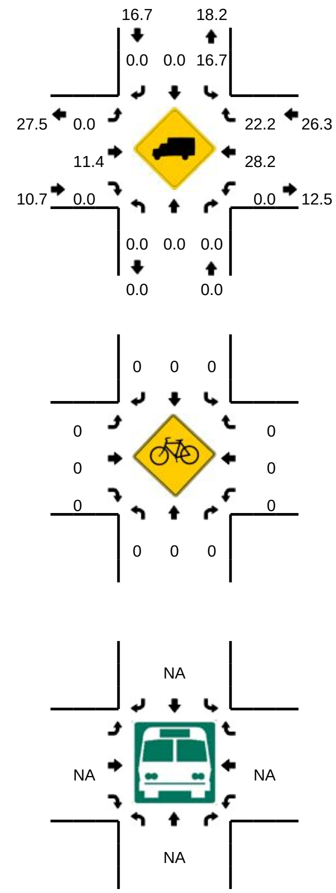
CITY/STATE: Coos County, OR **DATE:** Wed, Aug 13 2014



Peak-Hour: 4:10 PM -- 5:10 PM

Peak 15-Min: 4:35 PM -- 4:50 PM





5-Min Count Period Beginning At	Horsfall Beach Rd (Northbound) Left	Thru	Right	U	Horsfall Beach Rd (Southbound) Left	Thru	Right	U	Trans Pacific Ln (Eastbound) Left	Thru	Right	U	Trans Pacific Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
3:40 PM	0	0	0	0	2	0	0	0	0	7	0	0	0	1	0	0	10	131
3:45 PM	0	0	0	0	1	0	0	0	0	0	0	0	0	5	2	0	8	127
3:50 PM	0	0	0	0	1	0	0	0	1	6	0	0	0	1	1	0	10	129
3:55 PM	0	0	0	0	2	0	1	0	1	1	0	0	0	4	1	0	10	127
4:00 PM	0	0	0	0	1	0	0	0	1	5	0	0	0	2	1	0	10	129
4:05 PM	0	0	0	0	1	0	0	0	1	2	0	0	0	1	3	0	8	128
4:10 PM	0	0	0	0	2	0	0	0	0	8	0	1	0	2	2	0	15	135
4:15 PM	0	0	0	0	1	0	0	0	0	1	0	0	0	4	2	0	8	135
4:20 PM	0	0	0	0	2	0	0	0	0	3	0	0	0	5	1	0	11	135
4:25 PM	0	0	0	0	1	0	0	0	2	1	0	0	0	4	1	0	9	131
4:30 PM	0	0	0	0	4	0	0	0	0	8	0	0	0	2	3	0	17	133
4:35 PM	0	0	0	0	2	0	0	0	0	13	0	0	0	2	2	0	19	135
4:40 PM	0	0	0	0	0	0	0	0	0	11	0	0	0	4	1	0	16	141
4:45 PM	0	0	0	0	1	0	0	0	1	7	0	0	0	2	0	0	11	144
4:50 PM	0	0	0	0	1	0	0	0	0	5	0	0	0	5	1	0	12	146
4:55 PM	0	0	0	0	2	0	0	0	0	3	0	0	0	1	2	0	8	144
5:00 PM	0	0	0	0	0	0	0	0	0	4	0	0	0	5	2	0	11	145
5:05 PM	0	0	0	0	2	0	0	0	1	6	0	0	0	3	1	0	13	150
5:10 PM	0	0	0	0	0	0	0	0	0	10	0	0	0	1	0	0	11	146
5:15 PM	0	0	0	0	2	0	0	0	0	5	0	0	0	1	3	0	11	149
5:20 PM	0	0	0	0	1	0	0	0	0	4	0	0	0	1	1	0	7	145
5:25 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	1	5	0	9	145
5:30 PM	0	0	0	0	2	0	0	0	0	4	0	0	0	3	1	0	10	138
5:35 PM	0	0	0	0	2	0	0	0	1	3	0	1	0	2	1	1	11	130

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	0	0	12	0	0	0	4	124	0	0	0	32	12	0	184
Heavy Trucks	0	0	0		4	0	0		0	12	0		0	8	0		24
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

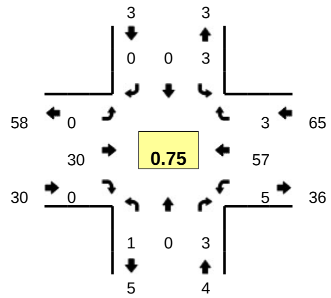
Comments:

Report generated on 8/18/2014 11:00 AM SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak | Method for determining peak hour: Total Entering Volume

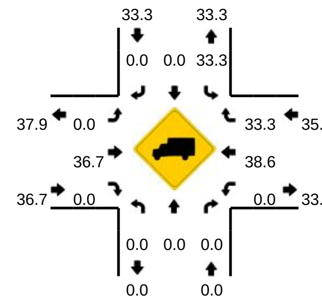
LOCATION: Dune Rec Site Dwy -- Trans Pacific Ln | **QC JOB #:** 12764707

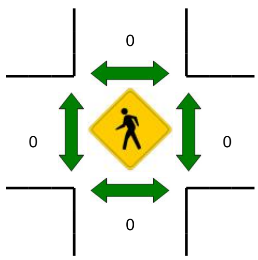
CITY/STATE: Coos County, OR | **DATE:** Wed, Aug 13 2014

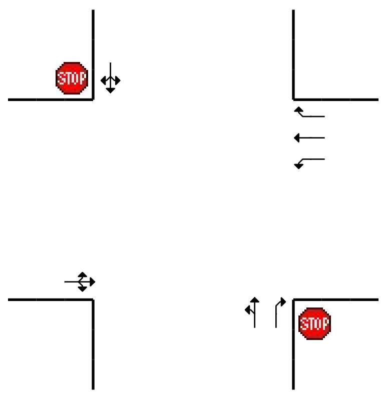


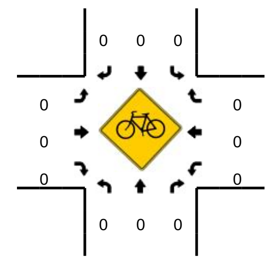
Peak-Hour: 8:00 AM -- 9:00 AM

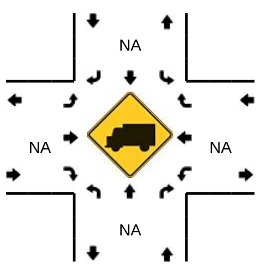
Peak 15-Min: 8:45 AM -- 9:00 AM

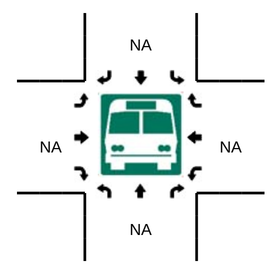












5-Min Count Period Beginning At	Dune Rec Site Dwy (Northbound)				Dune Rec Site Dwy (Southbound)				Trans Pacific Ln (Eastbound)				Trans Pacific Ln (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	3	0	0	4	52
7:05 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	1	0	0	6	57
7:10 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	56
7:15 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	5	59
7:20 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	6	63
7:25 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	10	0	0	12	66
7:30 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	4	0	0	6	67
7:35 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	3	0	0	5	69
7:40 AM	0	0	0	0	0	0	0	0	0	2	0	0	0	6	1	0	9	74
7:45 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	6	73
7:50 AM	0	0	0	0	0	0	0	0	0	4	0	0	1	5	0	0	10	76
7:55 AM	0	0	0	0	0	0	0	0	0	3	0	0	0	2	0	0	5	76
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	74
8:05 AM	0	0	0	0	0	0	0	0	0	4	0	0	0	6	0	0	10	78
8:10 AM	0	0	1	0	0	0	0	0	0	2	0	0	0	1	1	0	5	81
8:15 AM	0	0	0	0	0	0	0	0	0	1	0	0	0	5	0	0	6	82
8:20 AM	0	0	0	0	0	0	0	0	0	5	0	0	0	5	0	0	10	86
8:25 AM	0	0	0	0	1	0	0	0	0	3	0	0	0	6	2	0	12	86
8:30 AM	0	0	0	0	1	0	0	0	0	1	0	0	2	2	0	0	6	86
8:35 AM	1	0	0	0	0	0	0	0	0	2	0	0	0	6	0	0	9	90
8:40 AM	0	0	0	0	1	0	0	0	0	1	0	0	0	6	0	0	8	89
8:45 AM	0	0	0	0	0	0	0	0	0	2	0	0	1	9	0	0	12	95
8:50 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0	0	8	93
8:55 AM	0	0	2	0	0	0	0	0	0	9	0	0	0	3	0	0	14	102

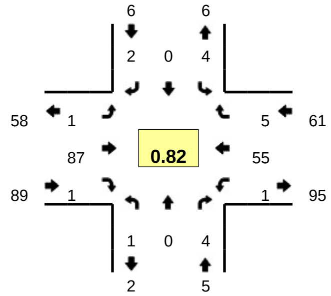
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	8	0	0	0	0	0	0	44	0	0	12	72	0	0	136
Heavy Trucks	0	0	0		0	0	0		0	4	0		0	40	0		44
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments: Driveway to Dune recreation site on North and access to Jordan Cove Road on South

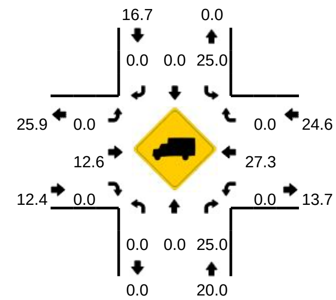
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

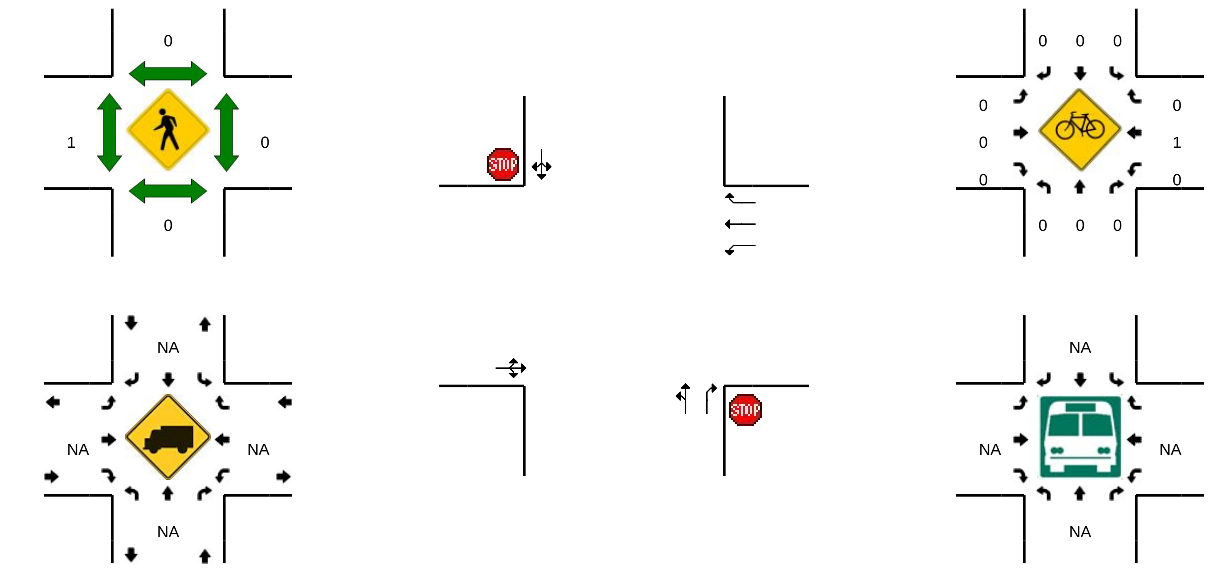
LOCATION: Dune Rec Site Dwy -- Trans Pacific Ln | **QC JOB #:** 12764708

CITY/STATE: Coos County, OR | **DATE:** Tue, Aug 12 2014



Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:35 PM -- 4:50 PM





5-Min Count Period Beginning At	Dune Rec Site Dwy (Northbound) Left	Thru	Right	U	Dune Rec Site Dwy (Southbound) Left	Thru	Right	U	Trans Pacific Ln (Eastbound) Left	Thru	Right	U	Trans Pacific Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
3:40 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	1	0	0	10	135
3:45 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	5	1	0	8	129
3:50 PM	0	0	0	0	0	0	0	0	0	7	0	0	1	3	2	0	13	132
3:55 PM	0	0	0	0	0	0	0	0	0	3	0	0	0	4	0	0	7	128
4:00 PM	0	0	0	0	1	0	1	0	0	4	0	0	0	3	1	0	10	130
4:05 PM	0	0	0	0	0	0	0	0	0	5	0	0	1	2	0	0	8	133
4:10 PM	0	0	0	0	0	0	0	0	0	10	0	0	0	5	0	0	15	137
4:15 PM	0	0	1	0	0	0	0	0	0	2	0	0	0	6	0	0	9	139
4:20 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	5	0	0	11	139
4:25 PM	0	0	1	0	0	0	0	0	0	2	0	0	1	6	0	0	10	134
4:30 PM	0	0	0	0	1	0	0	0	1	10	1	0	0	6	0	0	19	140
4:35 PM	0	0	1	0	2	0	0	0	0	11	0	0	0	3	0	0	17	137
4:40 PM	0	0	0	0	0	0	0	0	0	15	0	0	0	5	0	0	20	147
4:45 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	2	2	0	12	151
4:50 PM	0	0	1	0	0	0	0	0	0	6	0	0	0	5	2	0	14	152
4:55 PM	0	0	0	0	1	0	0	0	0	5	0	0	0	4	1	0	11	156
5:00 PM	0	0	0	0	0	0	2	0	0	4	0	0	0	5	0	0	11	157
5:05 PM	1	0	0	0	0	0	0	0	0	8	0	0	0	3	0	0	12	161
5:10 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	1	1	0	10	156
5:15 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	2	0	0	8	155
5:20 PM	0	0	0	0	1	0	0	0	0	8	0	0	0	4	1	0	14	158
5:25 PM	0	0	0	0	2	0	1	0	0	2	0	0	0	5	3	0	13	161
5:30 PM	0	0	0	0	0	0	0	0	0	6	0	0	0	4	0	0	10	152
5:35 PM	0	0	0	0	0	0	2	0	0	7	0	0	0	2	1	0	12	147

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	0	4	0	8	0	0	0	0	136	0	0	0	40	8	0	196
Heavy Trucks	0	0	0		0	0	0		0	16	0		0	8	0		24
Pedestrians		0				0				4				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

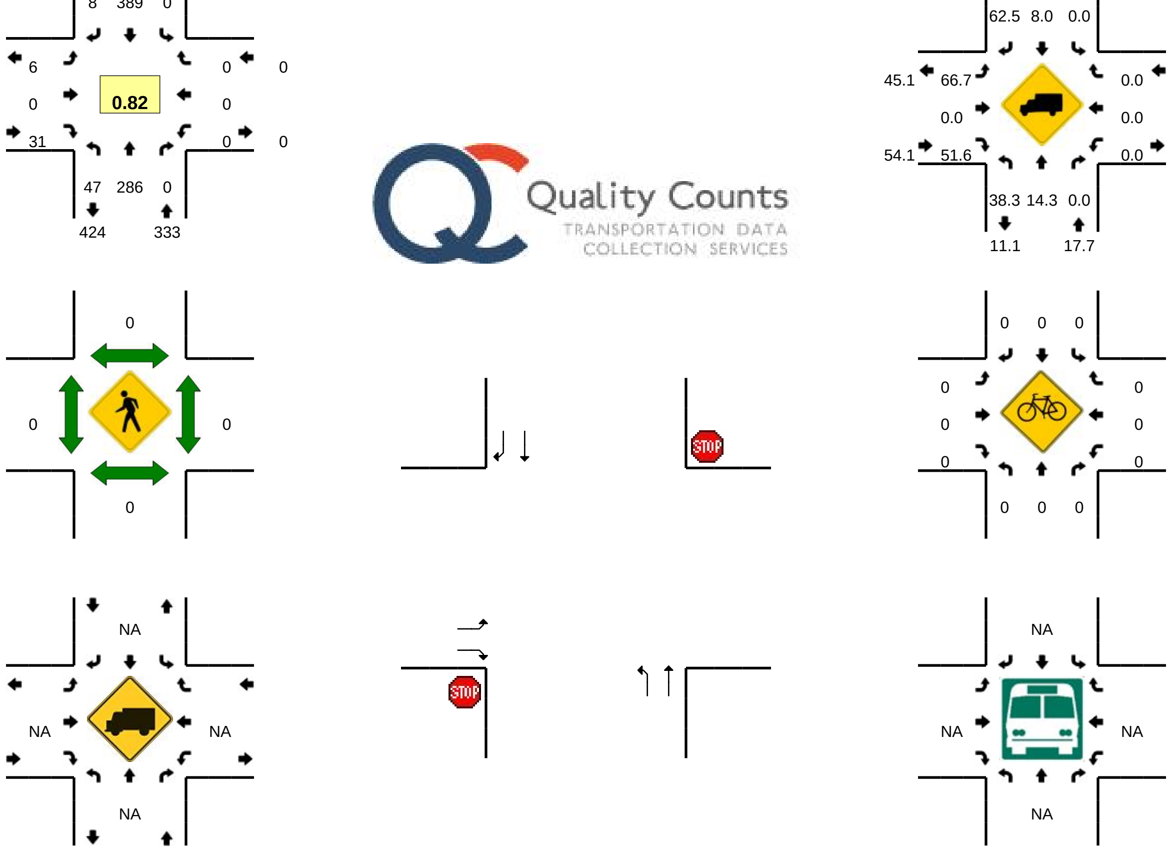
Comments: Driveway to Dune recreation site on North and access to Jordan Cove Road on South

Type of peak hour being reported: Intersection Peak — Method for determining peak hour: Total Entering Volume

LOCATION: US 101 -- Trans Pacific Ln — **QC JOB #:** 12764705

CITY/STATE: Coos County, OR — **DATE:** Thu, Aug 14 2014

Peak-Hour: 8:00 AM -- 9:00 AM
Peak 15-Min: 8:40 AM -- 8:55 AM



5-Min Count Period Beginning At	US 101 (Northbound) Left	Thru	Right	U	US 101 (Southbound) Left	Thru	Right	U	Trans Pacific Ln (Eastbound) Left	Thru	Right	U	Trans Pacific Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	1	24	0	0	0	20	0	0	0	0	1	0	0	0	0	0	46	439
7:05 AM	1	14	0	0	0	21	1	0	0	0	4	0	0	0	0	0	41	455
7:10 AM	4	21	0	0	0	30	0	0	0	0	0	0	0	0	0	0	55	479
7:15 AM	2	23	0	0	0	41	2	0	3	0	2	0	0	0	0	0	73	529
7:20 AM	3	25	0	0	0	19	0	0	0	0	0	0	0	0	0	0	47	541
7:25 AM	10	21	0	0	0	32	0	0	1	0	2	0	0	0	0	0	66	570
7:30 AM	8	21	0	0	0	27	3	0	1	0	1	0	0	0	0	0	61	590
7:35 AM	4	20	0	0	0	35	1	0	1	0	1	0	0	0	0	0	62	616
7:40 AM	3	20	0	0	0	35	2	0	0	0	0	0	0	0	0	0	60	641
7:45 AM	7	19	0	0	0	51	1	0	0	0	0	0	0	0	0	0	78	678
7:50 AM	5	21	0	0	0	35	2	0	0	0	3	0	0	0	0	0	66	702
7:55 AM	2	24	0	0	0	37	0	0	0	0	1	0	0	0	0	0	64	719
8:00 AM	3	21	0	0	0	25	0	0	0	0	2	0	0	0	0	0	51	724
8:05 AM	2	21	0	0	0	28	0	0	1	0	3	0	0	0	0	0	55	738
8:10 AM	4	28	0	0	0	33	0	0	1	0	0	0	0	0	0	0	66	749
8:15 AM	1	19	0	0	0	22	1	0	1	0	1	0	0	0	0	0	45	721
8:20 AM	6	26	0	0	0	28	0	0	1	0	4	0	0	0	0	0	65	739
8:25 AM	4	22	0	0	0	32	1	0	0	0	3	0	0	0	0	0	62	735
8:30 AM	9	29	0	0	0	29	1	0	0	0	0	0	0	0	0	0	68	742
8:35 AM	2	16	0	1	0	32	0	0	1	0	3	0	0	0	0	0	55	735
8:40 AM	3	34	0	1	0	43	4	0	0	0	3	0	0	0	0	0	88	763
8:45 AM	3	28	0	0	0	30	0	0	0	0	4	0	0	0	0	0	65	750
8:50 AM	5	20	0	1	0	50	1	0	0	0	3	0	0	0	0	0	80	764
8:55 AM	1	22	0	1	0	37	0	0	1	0	5	0	0	0	0	0	67	767

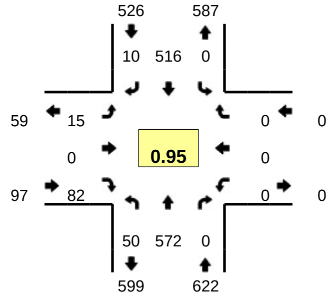
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	44	328	0	8	0	492	20	0	0	0	40	0	0	0	0	0	932
Heavy Trucks	12	40	0		0	24	12		0	0	20		0	0	0		108
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

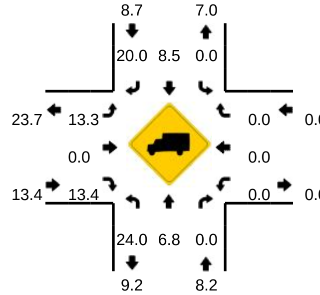
Comments:

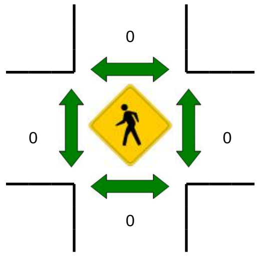
Type of peak hour being reported: System Peak — Method for determining peak hour: Total Entering Volume

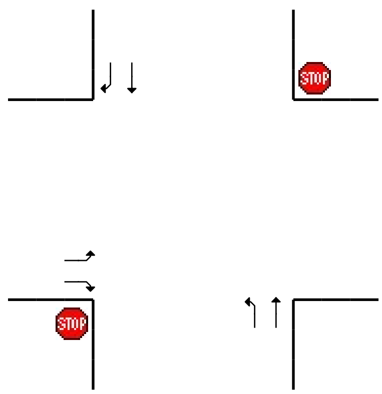
LOCATION: US 101 -- Trans Pacific Ln — **QC JOB #:** 12764706
CITY/STATE: Coos County, OR — **DATE:** Tue, Aug 12 2014

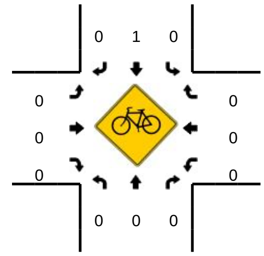
Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

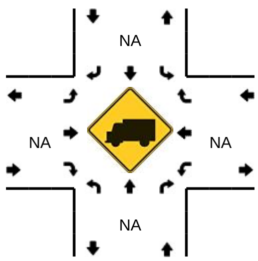


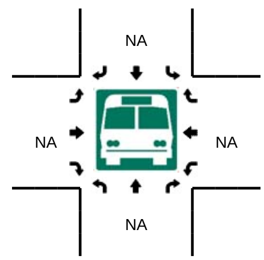












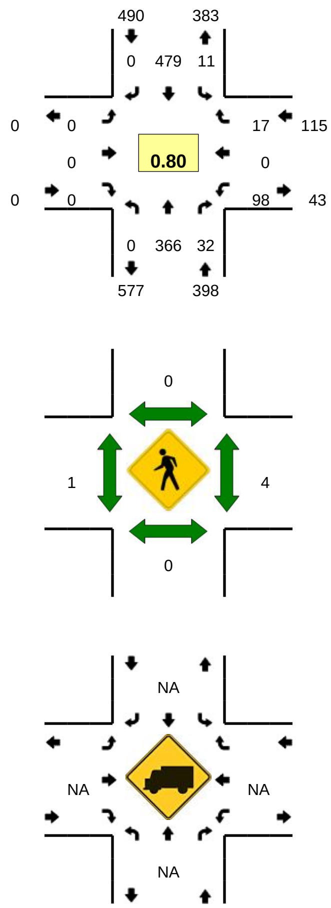
5-Min Count Period Beginning At	US 101 (Northbound) Left	Thru	Right	U	US 101 (Southbound) Left	Thru	Right	U	Trans Pacific Ln (Eastbound) Left	Thru	Right	U	Trans Pacific Ln (Westbound) Left	Thru	Right	U	Total	Hourly Totals
3:40 PM	7	43	0	0	0	54	0	0	2	0	6	0	0	0	0	0	112	1205
3:45 PM	5	52	0	0	0	47	0	0	0	0	5	0	0	0	0	0	109	1213
3:50 PM	4	45	0	0	0	46	0	0	1	0	2	0	0	0	0	0	98	1203
3:55 PM	3	43	0	0	0	32	2	0	0	0	3	0	0	0	0	0	83	1187
4:00 PM	3	44	0	0	0	31	0	0	2	0	6	0	0	0	0	0	86	1184
4:05 PM	2	45	0	0	0	51	3	0	1	0	2	0	0	0	0	0	104	1192
4:10 PM	5	52	0	0	0	41	0	0	2	0	7	0	0	0	0	0	107	1196
4:15 PM	4	38	0	1	0	37	2	0	0	0	3	0	0	0	0	0	85	1207
4:20 PM	7	54	0	0	0	47	1	0	1	0	6	0	0	0	0	0	116	1236
4:25 PM	6	37	0	0	0	46	0	0	2	0	5	0	0	0	0	0	96	1217
4:30 PM	0	48	0	0	0	42	3	0	1	0	6	0	0	0	0	0	100	1216
4:35 PM	4	36	0	0	0	48	1	0	3	0	21	0	0	0	0	0	113	1209
4:40 PM	4	48	0	0	0	46	0	0	1	0	4	0	0	0	0	0	103	1200
4:45 PM	6	53	0	0	0	41	1	0	1	0	8	0	0	0	0	0	110	1201
4:50 PM	4	47	0	0	0	48	1	0	1	0	6	0	0	0	0	0	107	1210
4:55 PM	4	54	0	0	0	26	1	0	1	0	4	0	0	0	0	0	90	1217
5:00 PM	3	47	0	0	0	46	0	0	0	0	4	0	0	0	0	0	100	1231
5:05 PM	2	58	0	0	0	48	0	0	2	0	8	0	0	0	0	0	118	1245
5:10 PM	3	36	0	0	0	38	0	0	4	0	6	0	0	0	0	0	87	1225
5:15 PM	1	55	0	0	0	32	3	0	0	0	7	0	0	0	0	0	98	1238
5:20 PM	5	53	0	0	0	41	2	0	1	0	4	0	0	0	0	0	106	1228
5:25 PM	3	41	0	0	0	38	1	0	1	0	5	0	0	0	0	0	89	1221
5:30 PM	2	42	0	0	0	54	2	0	2	0	2	0	0	0	0	0	104	1225
5:35 PM	0	41	0	0	0	45	0	0	1	0	5	0	0	0	0	0	92	1204

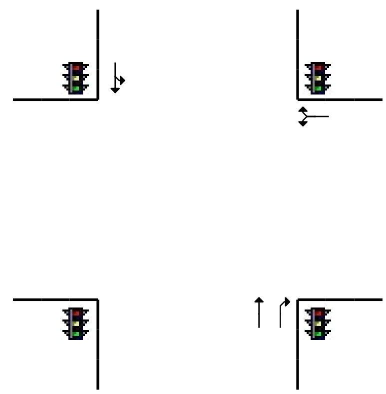
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	56	548	0	0	0	540	8	0	20	0	132	0	0	0	0	0	1304
Heavy Trucks	8	24	0		0	28	0		0	0	16		0	0	0		76
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

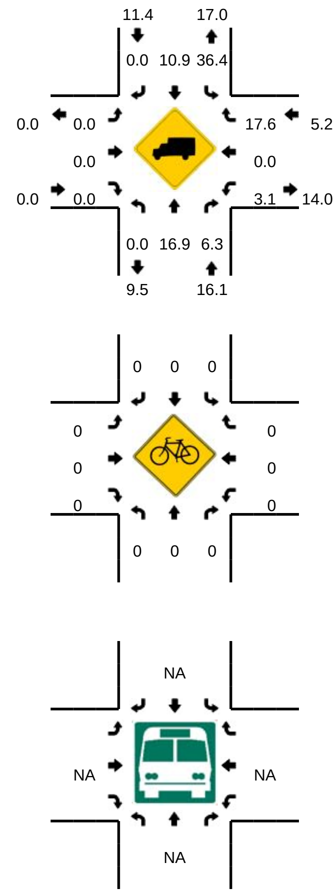
Comments:

LOCATION: US 101 -- E Bay Rd | **QC JOB #:** 12764703
CITY/STATE: North Bend, OR | **DATE:** Wed, Aug 13 2014

Peak-Hour: 7:40 AM -- 8:40 AM
Peak 15-Min: 7:40 AM -- 7:55 AM







5-Min Count Period Beginning At	US 101 (Northbound) Left	Thru	Right	U	US 101 (Southbound) Left	Thru	Right	U	E Bay Rd (Eastbound) Left	Thru	Right	U	E Bay Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	13	2	0	0	27	0	0	0	0	0	0	6	0	0	0	48	526
7:05 AM	0	22	0	0	0	26	0	0	0	0	0	0	7	0	0	0	55	549
7:10 AM	0	20	0	0	0	33	0	0	0	0	0	0	5	0	6	0	64	589
7:15 AM	0	19	1	0	0	38	0	0	0	0	0	0	3	0	3	0	64	616
7:20 AM	0	33	2	0	1	41	0	0	0	0	0	0	4	0	0	0	81	651
7:25 AM	0	18	1	0	0	39	0	0	0	0	0	0	6	0	0	0	64	671
7:30 AM	0	30	1	0	1	44	0	0	0	0	0	0	4	0	1	0	81	712
7:35 AM	0	16	2	0	2	33	0	0	0	0	0	0	13	0	4	0	70	728
7:40 AM	0	26	2	0	0	61	0	0	0	0	0	0	12	0	1	0	102	794
7:45 AM	0	28	1	0	1	63	0	0	0	0	0	0	11	0	1	0	105	844
7:50 AM	0	32	4	0	3	52	0	0	0	0	0	0	13	0	2	0	106	910
7:55 AM	0	22	5	0	0	29	0	0	0	0	0	0	7	0	2	0	65	905
8:00 AM	0	30	4	0	0	30	0	0	0	0	0	0	9	0	1	0	74	931
8:05 AM	0	35	2	0	0	29	0	0	0	0	0	0	7	0	1	0	74	950
8:10 AM	0	30	1	0	2	31	0	0	0	0	0	0	8	0	0	0	72	958
8:15 AM	0	38	2	0	0	32	0	0	0	0	0	0	1	0	2	0	75	969
8:20 AM	0	36	2	0	1	33	0	0	0	0	0	0	4	0	1	0	77	965
8:25 AM	0	32	4	0	0	40	0	0	0	0	0	0	10	0	1	0	87	988
8:30 AM	0	28	0	0	2	41	0	0	0	0	0	0	8	0	3	0	82	989
8:35 AM	0	29	5	0	2	38	0	0	0	0	0	0	8	0	2	0	84	1003
8:40 AM	0	40	1	0	1	42	0	0	0	0	0	0	14	0	1	0	99	1000
8:45 AM	0	19	0	0	0	49	0	0	0	0	0	0	13	0	0	0	81	976
8:50 AM	0	34	5	0	0	38	0	0	0	0	0	0	8	0	0	0	85	955
8:55 AM	0	31	1	0	0	37	0	0	0	0	0	0	4	0	0	0	73	963

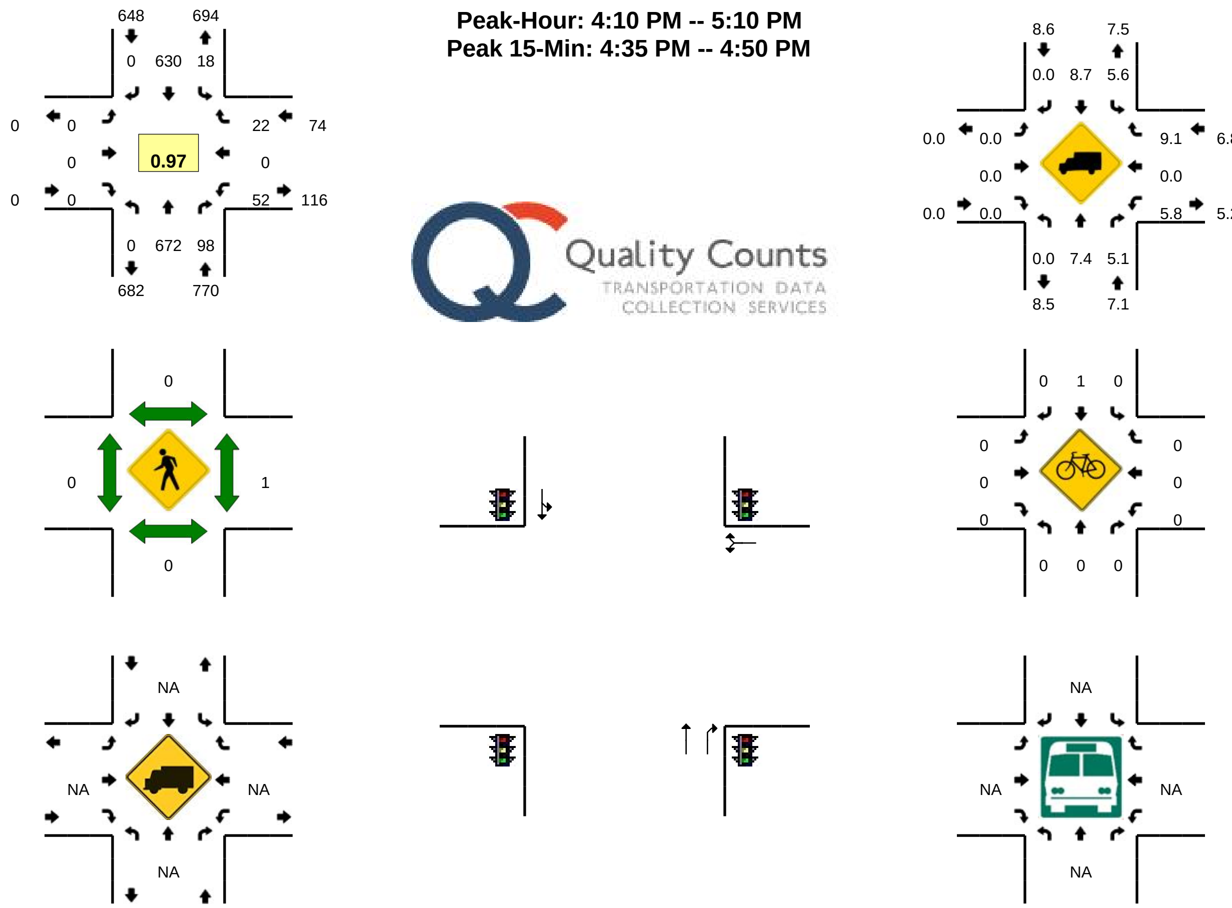
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	344	28	0	16	704	0	0	0	0	0	0	144	0	16	0	1252
Heavy Trucks	0	44	0		4	60	0		0	0	0		0	0	4		112
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

LOCATION: US 101 -- E Bay Rd | **QC JOB #:** 12764704
CITY/STATE: North Bend, OR | **DATE:** Tue, Aug 12 2014

Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:35 PM -- 4:50 PM



5-Min Count Period Beginning At	US 101 (Northbound) Left	Thru	Right	U	US 101 (Southbound) Left	Thru	Right	U	E Bay Rd (Eastbound) Left	Thru	Right	U	E Bay Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
3:40 PM	0	52	6	0	2	77	0	0	0	0	0	0	4	0	3	0	144	1439
3:45 PM	0	65	10	0	3	53	0	0	0	0	0	0	4	0	6	0	141	1454
3:50 PM	0	58	6	0	0	64	0	0	0	0	0	0	6	0	1	0	135	1475
3:55 PM	0	44	9	0	0	48	0	0	0	0	0	0	6	0	3	0	110	1459
4:00 PM	0	43	5	0	0	30	0	0	0	0	0	0	7	0	2	0	87	1414
4:05 PM	0	58	12	0	2	42	0	0	0	0	0	0	5	0	1	0	120	1418
4:10 PM	0	53	5	0	1	61	0	0	0	0	0	0	10	0	2	0	132	1448
4:15 PM	0	56	3	0	3	38	0	0	0	0	0	0	3	0	2	0	105	1435
4:20 PM	0	64	14	0	0	61	0	0	0	0	0	0	5	0	2	0	146	1475
4:25 PM	0	53	8	0	1	45	0	0	0	0	0	0	8	0	3	0	118	1485
4:30 PM	0	58	4	0	1	53	0	0	0	0	0	0	8	0	1	0	125	1469
4:35 PM	0	42	13	0	2	60	0	0	0	0	0	0	1	0	2	0	120	1483
4:40 PM	0	58	9	0	2	62	0	0	0	0	0	0	3	0	1	0	135	1474
4:45 PM	0	60	7	0	4	53	0	0	0	0	0	0	4	0	3	0	131	1464
4:50 PM	0	56	7	0	0	54	0	0	0	0	0	0	2	0	1	0	120	1449
4:55 PM	0	48	7	0	1	51	0	0	0	0	0	0	5	0	4	0	116	1455
5:00 PM	0	61	6	0	0	32	0	0	0	0	0	0	1	0	0	0	100	1468
5:05 PM	0	63	15	0	3	60	0	0	0	0	0	0	2	0	1	0	144	1492
5:10 PM	0	62	11	0	1	46	0	0	0	0	0	0	1	0	1	0	122	1482
5:15 PM	0	47	8	0	2	45	0	0	0	0	0	0	2	0	1	0	105	1482
5:20 PM	0	71	15	0	1	42	0	0	0	0	0	0	6	0	0	0	135	1471
5:25 PM	0	49	9	0	1	54	0	0	0	0	0	0	4	0	0	0	117	1470
5:30 PM	0	48	12	0	3	39	0	0	0	0	0	0	5	0	2	0	109	1454
5:35 PM	0	56	9	0	1	56	0	0	0	0	0	0	7	0	1	0	130	1464

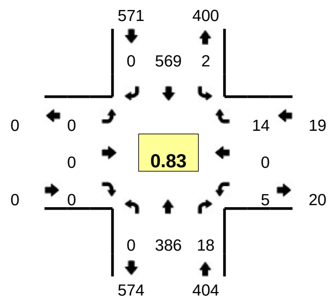
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	640	116	0	32	700	0	0	0	0	0	0	32	0	24	0	1544
Heavy Trucks	0	36	4		4	24	0		0	0	0		0	0	0		68
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

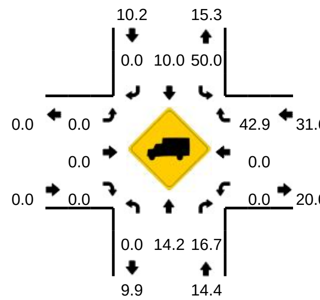
Comments:

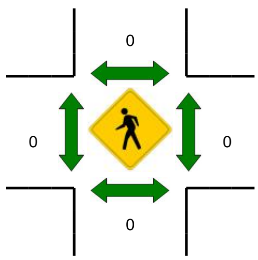
Type of peak hour being reported: Intersection Peak   Method for determining peak hour: Total Entering Volume

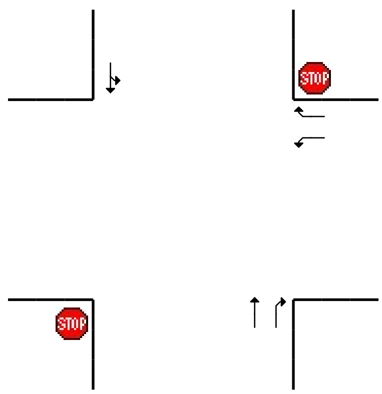
LOCATION: US 101 -- Ferry Rd   **QC JOB #:** 12764701
CITY/STATE: North Bend, OR   **DATE:** Wed, Aug 13 2014

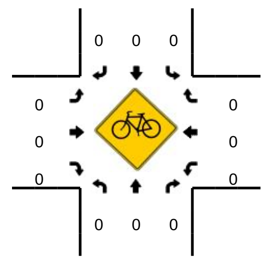
Peak-Hour: 7:40 AM -- 8:40 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

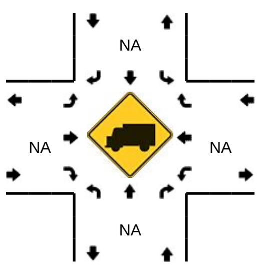


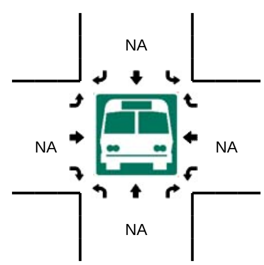












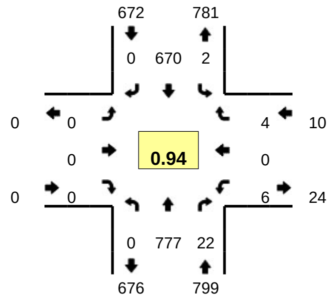
5-Min Count Period Beginning At	US 101 (Northbound) Left	Thru	Right	U	US 101 (Southbound) Left	Thru	Right	U	Ferry Rd (Eastbound) Left	Thru	Right	U	Ferry Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	0	18	2	0	0	31	0	0	0	0	0	0	1	0	0	0	52	529
7:05 AM	0	21	3	0	1	31	0	0	0	0	0	0	0	0	0	0	56	548
7:10 AM	0	20	4	0	0	41	0	0	0	0	0	0	0	0	0	0	65	592
7:15 AM	0	25	1	0	0	41	0	0	0	0	0	0	0	0	0	0	67	620
7:20 AM	0	28	1	0	1	36	0	0	0	0	0	0	0	0	1	0	67	635
7:25 AM	0	20	3	0	0	41	0	0	0	0	0	0	0	0	2	0	66	674
7:30 AM	0	27	1	0	0	39	0	0	0	0	0	0	0	0	0	0	67	691
7:35 AM	0	19	1	0	1	61	0	0	0	0	0	0	1	0	0	0	83	723
7:40 AM	0	36	1	0	0	59	0	0	0	0	0	0	0	0	1	0	97	780
7:45 AM	0	27	3	0	0	72	0	0	0	0	0	0	1	0	1	0	104	831
7:50 AM	0	35	0	0	1	62	0	0	0	0	0	0	2	0	0	0	100	888
7:55 AM	0	22	3	0	0	54	0	0	0	0	0	0	0	0	2	0	81	905
8:00 AM	0	32	2	0	0	38	0	0	0	0	0	0	0	0	0	0	72	925
8:05 AM	0	40	1	0	0	33	0	0	0	0	0	0	0	0	1	0	75	944
8:10 AM	0	30	3	0	0	45	0	0	0	0	0	0	0	0	2	0	80	959
8:15 AM	0	35	1	0	0	28	0	0	0	0	0	0	0	0	3	0	67	959
8:20 AM	0	36	0	0	1	33	0	0	0	0	0	0	0	0	0	0	70	962
8:25 AM	0	32	0	0	0	48	0	0	0	0	0	0	0	0	0	0	80	976
8:30 AM	0	35	3	0	0	44	0	0	0	0	0	0	1	0	1	0	84	993
8:35 AM	0	26	1	0	0	53	0	0	0	0	0	0	1	0	3	0	84	994
8:40 AM	0	36	0	0	1	52	0	0	0	0	0	0	1	0	1	0	91	988
8:45 AM	0	28	1	0	0	62	0	0	0	0	0	0	0	0	0	0	91	975
8:50 AM	0	33	0	0	0	53	0	0	0	0	0	0	0	0	0	0	86	961
8:55 AM	0	30	0	0	1	44	0	0	0	0	0	0	0	0	1	0	76	956

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	392	16	0	4	772	0	0	0	0	0	0	12	0	8	0	1204
Heavy Trucks	0	48	0		4	60	0		0	0	0		0	0	0		112
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

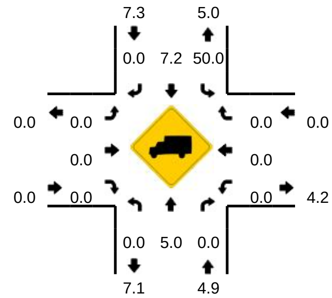
Comments:

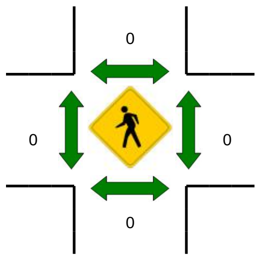
Type of peak hour being reported: System Peak | Method for determining peak hour: Total Entering Volume

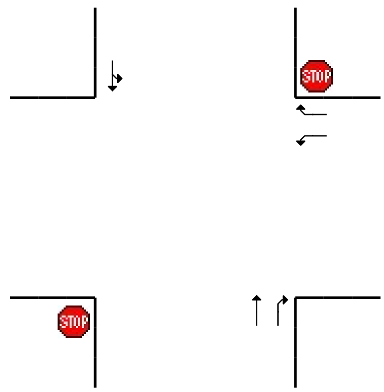
LOCATION: US 101 -- Ferry Rd | **QC JOB #:** 12764702
CITY/STATE: North Bend, OR | **DATE:** Tue, Aug 12 2014

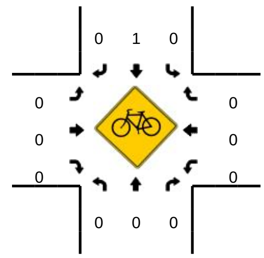


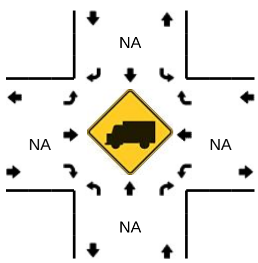
Peak-Hour: 4:10 PM -- 5:10 PM
Peak 15-Min: 4:35 PM -- 4:50 PM

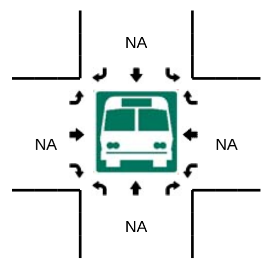












5-Min Count Period Beginning At	US 101 (Northbound) Left	Thru	Right	U	US 101 (Southbound) Left	Thru	Right	U	Ferry Rd (Eastbound) Left	Thru	Right	U	Ferry Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
3:40 PM	0	69	3	0	1	71	0	0	0	0	0	0	0	0	0	0	144	1430
3:45 PM	0	66	2	0	0	68	0	0	0	0	0	0	1	0	1	0	138	1470
3:50 PM	0	53	1	0	2	57	0	0	0	0	0	0	0	0	3	0	116	1454
3:55 PM	0	56	1	0	4	58	0	0	0	0	0	0	1	0	1	0	121	1451
4:00 PM	0	53	0	0	2	39	0	0	0	0	0	0	0	0	0	0	94	1407
4:05 PM	0	65	4	0	0	39	0	0	0	0	0	0	1	0	1	0	110	1412
4:10 PM	0	61	1	0	0	49	0	0	0	0	0	0	0	0	1	0	112	1408
4:15 PM	0	56	2	0	0	71	0	0	0	0	0	0	0	0	1	0	130	1437
4:20 PM	0	79	3	0	1	52	0	0	0	0	0	0	1	0	0	0	136	1456
4:25 PM	0	53	1	0	0	56	0	0	0	0	0	0	0	0	0	0	110	1449
4:30 PM	0	63	3	0	0	59	0	0	0	0	0	0	0	0	0	0	125	1464
4:35 PM	0	59	0	0	0	57	0	0	0	0	0	0	0	0	1	0	117	1453
4:40 PM	0	67	3	0	0	67	0	0	0	0	0	0	1	0	0	0	138	1447
4:45 PM	0	68	3	0	0	62	0	0	0	0	0	0	4	0	0	0	137	1446
4:50 PM	0	57	0	0	0	50	0	0	0	0	0	0	0	0	0	0	107	1437
4:55 PM	0	66	3	0	1	56	0	0	0	0	0	0	0	0	0	0	126	1442
5:00 PM	0	70	2	0	0	45	0	0	0	0	0	0	0	0	0	0	117	1465
5:05 PM	0	78	1	0	0	46	0	0	0	0	0	0	0	0	1	0	126	1481
5:10 PM	0	58	1	0	1	63	0	0	0	0	0	0	0	0	1	0	124	1493
5:15 PM	0	69	2	0	1	39	0	0	0	0	0	0	0	0	0	0	111	1474
5:20 PM	0	78	0	0	0	45	0	0	0	0	0	0	2	0	0	0	125	1463
5:25 PM	0	58	2	0	0	48	0	0	0	0	0	0	0	0	0	0	108	1461
5:30 PM	0	61	2	0	1	53	0	0	0	0	0	0	1	0	1	0	119	1455
5:35 PM	0	59	1	0	0	38	0	0	0	0	0	0	0	0	1	0	99	1437

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	0	776	24	0	0	744	0	0	0	0	0	0	20	0	4	0	1568
Heavy Trucks	0	36	0		0	28	0		0	0	0		0	0	0		64
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 8/18/2014 11:00 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Appendix C – Existing 2014 Conditions Operations Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	9	1	23	10	3	12
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Hourly flow rate (vph)	11	1	28	12	4	14
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			12		78	11
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			12		78	11
tC, single (s)			4.4		7.4	6.8
tC, 2 stage (s)						
tF (s)			2.5		4.4	3.8
p0 queue free %			98		99	98
cM capacity (veh/h)			1447		716	928

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	11	1	28	12	18
Volume Left	0	0	28	0	4
Volume Right	0	1	0	0	14
cSH	1700	1700	1447	1700	876
Volume to Capacity	0.01	0.00	0.02	0.01	0.02
Queue Length 95th (ft)	0	0	1	0	2
Control Delay (s)	0.0	0.0	7.5	0.0	9.2
Lane LOS			A		A
Approach Delay (s)	0.0		5.3		9.2
Approach LOS					A

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	21	33	0	1	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.71	0.71	0.71	0.71	0.71	0.71
Hourly flow rate (vph)	0	30	46	0	1	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	46				76	46
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	46				76	46
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1574				932	1029

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	30	46	0	1
Volume Left	0	0	0	0	1
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	746
Volume to Capacity	0.00	0.02	0.03	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	9.8
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.8
Approach LOS					A

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	22	0	0	33	0	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Hourly flow rate (vph)	0	31	0	0	46	0	0	0	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	46			31			77	77	31	77	77	46
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	46			31			77	77	31	77	77	46
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1574			1595			917	817	1049	917	817	1029

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	31	0	46	0	0	0	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1574	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.03	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS					A	A	A
Approach Delay (s)	0.0	0.0			0.0	0.0	
Approach LOS					A	A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	16	26	146	203	7
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	8	20	33	185	257	9
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	508	257	266			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	508	257	266			
tC, single (s)	7.4	6.9	4.6			
tC, 2 stage (s)						
tF (s)	4.4	3.9	2.6			
p0 queue free %	98	97	97			
cM capacity (veh/h)	375	644	1073			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	28	33	185	257	9
Volume Left	8	33	0	0	0
Volume Right	20	0	0	0	9
cSH	538	1073	1700	1700	1700
Volume to Capacity	0.05	0.03	0.11	0.15	0.01
Queue Length 95th (ft)	4	2	0	0	0
Control Delay (s)	12.1	8.5	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	12.1	1.3		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	28.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	56	9	180	13	3	247
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1525	1340	1458	1293		1498
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	1525	1340	1458	1293		1494
Peak-hour factor, PHF	0.77	0.77	0.77	0.77	0.77	0.77
Adj. Flow (vph)	73	12	234	17	4	321
RTOR Reduction (vph)	0	10	0	6	0	0
Lane Group Flow (vph)	73	2	234	11	0	325
Heavy Vehicles (%)	9%	11%	20%	15%	0%	22%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.8	5.8	23.6	23.6		23.6
Effective Green, g (s)	6.8	6.8	26.6	26.6		26.6
Actuated g/C Ratio	0.16	0.16	0.64	0.64		0.64
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	250	220	936	830		959
v/s Ratio Prot	c0.05		0.16			
v/s Ratio Perm		0.00		0.01		c0.22
v/c Ratio	0.29	0.01	0.25	0.01		0.34
Uniform Delay, d1	15.2	14.5	3.2	2.7		3.4
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.7	0.0	0.3	0.0		0.5
Delay (s)	15.8	14.5	3.5	2.7		3.9
Level of Service	B	B	A	A		A
Approach Delay (s)	15.6		3.4			3.9
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	5.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	41.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	28.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	3	190	8	3	300
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.78	0.78	0.78	0.78	0.78	0.78
Hourly flow rate (vph)	4	4	244	10	4	385
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	636	244			254	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	636	244			254	
tC, single (s)	6.4	6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	444	725			1323	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	8	244	10	388
Volume Left	4	0	0	4
Volume Right	4	0	10	0
cSH	888	1700	1700	1323
Volume to Capacity	0.01	0.14	0.01	0.00
Queue Length 95th (ft)	1	0	0	0
Control Delay (s)	11.6	0.0	0.0	0.1
Lane LOS	B			A
Approach Delay (s)	11.6	0.0		0.1
Approach LOS	B			

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 20: Jordan Cove Road & Transpacific /Transpacific

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	15	50
Average Queue (ft)	1	4
95th Queue (ft)	8	28
Link Distance (ft)		728
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: Transpacific & Horsfall Beach Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	18
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	909
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 40: Transpacific & Boxcar Hill

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: US 101 & Transpacific

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	80	60
Average Queue (ft)	22	8
95th Queue (ft)	64	37
Link Distance (ft)	2389	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		500
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 60: US 101 & East Bay Drive

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	89	51	118	54	137
Average Queue (ft)	30	12	26	4	43
95th Queue (ft)	66	43	79	25	110
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	10	1	0	0	
Queuing Penalty (veh)	1	1	0	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	SB
Directions Served	L	R	LT
Maximum Queue (ft)	27	51	18
Average Queue (ft)	2	6	1
95th Queue (ft)	15	30	9
Link Distance (ft)	317		495
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		25	
Storage Blk Time (%)	0	0	
Queuing Penalty (veh)	0	0	

Zone Summary

Zone wide Queuing Penalty: 2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	55	0	13	13	1	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.66	0.66	0.66	0.66	0.66	0.66
Hourly flow rate (vph)	83	0	20	20	2	35
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			83		142	83
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			83		142	83
tC, single (s)			4.5		7.4	6.5
tC, 2 stage (s)						
tF (s)			2.6		4.4	3.5
p0 queue free %			98		100	96
cM capacity (veh/h)			1310		655	914

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	83	0	20	20	36
Volume Left	0	0	20	0	2
Volume Right	0	0	0	0	35
cSH	1700	1700	1310	1700	899
Volume to Capacity	0.05	0.00	0.02	0.01	0.04
Queue Length 95th (ft)	0	0	1	0	3
Control Delay (s)	0.0	0.0	7.8	0.0	9.2
Lane LOS			A		A
Approach Delay (s)	0.0		3.9		9.2
Approach LOS					A

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	17.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	76	26	23	17	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	3	106	36	32	24	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	36				147	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	36				147	36
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1588				803	1042

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	3	106	36	32	24
Volume Left	3	0	0	0	24
Volume Right	0	0	0	32	0
cSH	1588	1700	1700	1700	791
Volume to Capacity	0.00	0.06	0.02	0.02	0.03
Queue Length 95th (ft)	0	0	0	0	2
Control Delay (s)	7.3	0.0	0.0	0.0	9.7
Lane LOS	A				A
Approach Delay (s)	0.2		0.0		9.7
Approach LOS					A

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	15.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	91	1	0	45	10	1	0	2	7	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	1	126	1	0	62	14	1	0	3	10	0	4
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	76			128			197	206	127	195	193	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	76			128			197	206	127	195	193	62
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.4	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.8	4.0	3.3
p0 queue free %	100			100			100	100	100	99	100	100
cM capacity (veh/h)	1535			1471			763	693	929	706	705	1008

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	129	0	62	14	4	10	4
Volume Left	1	0	0	0	1	10	0
Volume Right	1	0	0	14	3	0	4
cSH	1535	1700	1700	1700	866	706	1008
Volume to Capacity	0.00	0.00	0.04	0.01	0.00	0.01	0.00
Queue Length 95th (ft)	0	0	0	0	0	1	0
Control Delay (s)	0.1	0.0	0.0	0.0	9.2	10.2	8.6
Lane LOS	A				A	B	A
Approach Delay (s)	0.1	0.0			9.2	9.7	
Approach LOS					A	A	

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	23.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	16	84	40	576	494	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	16	87	41	594	509	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1186	509	525			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1186	509	525			
tC, single (s)	6.5	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.4			
p0 queue free %	92	84	96			
cM capacity (veh/h)	196	543	952			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	103	41	594	509	15
Volume Left	16	41	0	0	0
Volume Right	87	0	0	0	15
cSH	423	952	1700	1700	1700
Volume to Capacity	0.24	0.04	0.35	0.30	0.01
Queue Length 95th (ft)	24	3	0	0	0
Control Delay (s)	16.2	9.0	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	16.2	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	39	15	680	114	18	612
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1614	1488	1636	1430		1704
Flt Permitted	0.95	1.00	1.00	1.00		0.98
Satd. Flow (perm)	1614	1488	1636	1430		1665
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	40	15	701	118	19	631
RTOR Reduction (vph)	0	13	0	31	0	0
Lane Group Flow (vph)	40	2	701	87	0	650
Heavy Vehicles (%)	3%	0%	7%	4%	6%	7%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.5	5.5	33.2	33.2		33.2
Effective Green, g (s)	6.5	6.5	36.2	36.2		36.2
Actuated g/C Ratio	0.13	0.13	0.71	0.71		0.71
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	206	190	1168	1021		1188
v/s Ratio Prot	c0.02		c0.43			
v/s Ratio Perm		0.00		0.06		0.39
v/c Ratio	0.19	0.01	0.60	0.09		0.55
Uniform Delay, d1	19.8	19.3	3.6	2.2		3.4
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.5	0.0	1.3	0.1		1.0
Delay (s)	20.2	19.3	5.0	2.3		4.4
Level of Service	C	B	A	A		A
Approach Delay (s)	20.0		4.6			4.4
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	5.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	50.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	7	3	791	20	5	646
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	7	3	824	21	5	673
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1507	824			845	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1507	824			845	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	95	99			99	
cM capacity (veh/h)	134	376			800	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	10	824	21	678
Volume Left	7	0	0	5
Volume Right	3	0	21	0
cSH	191	1700	1700	800
Volume to Capacity	0.05	0.48	0.01	0.01
Queue Length 95th (ft)	4	0	0	0
Control Delay (s)	27.8	0.0	0.0	0.2
Lane LOS	D			A
Approach Delay (s)	27.8	0.0		0.2
Approach LOS	D			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 20: Jordan Cove Rd & Transpacific

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	18	32
Average Queue (ft)	1	1
95th Queue (ft)	12	14
Link Distance (ft)		728
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)	0	
Queuing Penalty (veh)	0	

Intersection: 30: Transpacific & Horsfall Beach Rd

Movement	WB	SB
Directions Served	R	L
Maximum Queue (ft)	7	70
Average Queue (ft)	0	13
95th Queue (ft)	6	44
Link Distance (ft)		909
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		1
Queuing Penalty (veh)		0

Intersection: 40: Transpacific & Boxcar Hill

Movement	NB	SB	SB
Directions Served	LTR	L	TR
Maximum Queue (ft)	33	49	23
Average Queue (ft)	2	6	2
95th Queue (ft)	15	28	14
Link Distance (ft)	194		143
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		25	
Storage Blk Time (%)		0	0
Queuing Penalty (veh)		0	0

Intersection: 50: US 101 & Transpacific

Movement	EB	NB
Directions Served	LR	L
Maximum Queue (ft)	154	78
Average Queue (ft)	51	21
95th Queue (ft)	111	59
Link Distance (ft)	2389	
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		500
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 60: US 101 & East Bay Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	73	45	302	125	429
Average Queue (ft)	26	16	109	22	126
95th Queue (ft)	56	47	238	80	302
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	11	2	5	0	
Queuing Penalty (veh)	2	1	6	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	SB
Directions Served	L	R	LT
Maximum Queue (ft)	35	39	77
Average Queue (ft)	6	4	6
95th Queue (ft)	26	24	45
Link Distance (ft)	317		495
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		25	
Storage Blk Time (%)	3	1	
Queuing Penalty (veh)	0	0	

Zone Summary

Zone wide Queuing Penalty: 9

Appendix D – 2018 Background Traffic Operations Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	10	5	25	15	5	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	6	29	18	6	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			18		88	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			18		88	12
tC, single (s)			4.4		7.4	6.8
tC, 2 stage (s)						
tF (s)			2.5		4.4	3.8
p0 queue free %			98		99	98
cM capacity (veh/h)			1440		705	927

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	12	6	29	18	24
Volume Left	0	0	29	0	6
Volume Right	0	6	0	0	18
cSH	1700	1700	1440	1700	859
Volume to Capacity	0.01	0.00	0.02	0.01	0.03
Queue Length 95th (ft)	0	0	2	0	2
Control Delay (s)	0.0	0.0	7.6	0.0	9.3
Lane LOS			A		A
Approach Delay (s)	0.0		4.7		9.3
Approach LOS					A

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	18.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	25	35	0	5	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	29	41	0	6	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	41				71	41
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	41				71	41
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				99	100
cM capacity (veh/h)	1581				939	1036

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	29	41	0	6
Volume Left	0	0	0	0	6
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	884
Volume to Capacity	0.00	0.02	0.02	0.00	0.01
Queue Length 95th (ft)	0	0	0	0	1
Control Delay (s)	0.0	0.0	0.0	0.0	9.1
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.1
Approach LOS					A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	25	0	0	35	0	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	29	0	0	41	0	0	0	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	41			29			71	71	29	71	71	41
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	41			29			71	71	29	71	71	41
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1581			1597			926	824	1051	926	824	1036

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	29	0	41	0	0	0	0
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0
cSH	1581	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.02	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS					A	A	A
Approach Delay (s)	0.0	0.0			0.0	0.0	
Approach LOS					A	A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	20	30	155	210	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	24	35	182	247	12
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	500	247	259			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	500	247	259			
tC, single (s)	7.4	6.9	4.6			
tC, 2 stage (s)						
tF (s)	4.4	3.9	2.6			
p0 queue free %	97	96	97			
cM capacity (veh/h)	378	653	1080			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	35	35	182	247	12
Volume Left	12	35	0	0	0
Volume Right	24	0	0	0	12
cSH	526	1080	1700	1700	1700
Volume to Capacity	0.07	0.03	0.11	0.15	0.01
Queue Length 95th (ft)	5	3	0	0	0
Control Delay (s)	12.3	8.4	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	12.3	1.4		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	28.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	60	10	190	15	5	255
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1525	1340	1458	1293		1500
Flt Permitted	0.95	1.00	1.00	1.00		0.99
Satd. Flow (perm)	1525	1340	1458	1293		1493
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	71	12	224	18	6	300
RTOR Reduction (vph)	0	10	0	6	0	0
Lane Group Flow (vph)	71	2	224	12	0	306
Heavy Vehicles (%)	9%	11%	20%	15%	0%	22%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.8	5.8	23.2	23.2		23.2
Effective Green, g (s)	6.8	6.8	26.2	26.2		26.2
Actuated g/C Ratio	0.17	0.17	0.64	0.64		0.64
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	252	222	931	826		954
v/s Ratio Prot	c0.05		0.15			
v/s Ratio Perm		0.00		0.01		c0.21
v/c Ratio	0.28	0.01	0.24	0.01		0.32
Uniform Delay, d1	15.0	14.3	3.2	2.7		3.4
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.6	0.0	0.3	0.0		0.4
Delay (s)	15.6	14.3	3.5	2.7		3.8
Level of Service	B	B	A	A		A
Approach Delay (s)	15.4		3.4			3.8
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	5.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	41.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	29.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	5	5	200	10	5	310
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	6	235	12	6	365
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	612	235			247	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	612	235			247	
tC, single (s)	6.4	6.5			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.6			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	458	733			1331	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	12	235	12	371
Volume Left	6	0	0	6
Volume Right	6	0	12	0
cSH	916	1700	1700	1331
Volume to Capacity	0.01	0.14	0.01	0.00
Queue Length 95th (ft)	1	0	0	0
Control Delay (s)	11.5	0.0	0.0	0.2
Lane LOS	B			A
Approach Delay (s)	11.5	0.0		0.2
Approach LOS	B			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	30.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 20: Jordan Cove Rd & Transpacific

Movement	EB	WB	NB
Directions Served	R	L	LR
Maximum Queue (ft)	5	12	67
Average Queue (ft)	0	0	9
95th Queue (ft)	4	7	43
Link Distance (ft)			728
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	75	75	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 30: Transpacific /Transpacific & Horsfall Beach Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	25
Average Queue (ft)	4
95th Queue (ft)	18
Link Distance (ft)	909
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 40: Transpacific & Boxcar Hill

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 50: US 101 & Transpacific

Movement	EB	NB	SB
Directions Served	LR	L	T
Maximum Queue (ft)	104	74	4
Average Queue (ft)	31	11	0
95th Queue (ft)	78	47	3
Link Distance (ft)	2389		1561
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		500	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 60: US 101 & East Bay Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	78	53	120	54	124
Average Queue (ft)	31	11	34	5	42
95th Queue (ft)	61	42	95	30	99
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	11	1	0	0	
Queuing Penalty (veh)	1	1	0	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	SB
Directions Served	L	R	LT
Maximum Queue (ft)	27	55	25
Average Queue (ft)	5	8	1
95th Queue (ft)	22	38	12
Link Distance (ft)	317		495
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		25	
Storage Blk Time (%)	1	1	
Queuing Penalty (veh)	0	0	

Zone Summary

Zone wide Queuing Penalty: 2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	60	0	15	15	5	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	71	0	18	18	6	29
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			71		124	71
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			71		124	71
tC, single (s)			4.5		7.4	6.5
tC, 2 stage (s)						
tF (s)			2.6		4.4	3.5
p0 queue free %			99		99	97
cM capacity (veh/h)			1325		675	929

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	71	0	18	18	35
Volume Left	0	0	18	0	6
Volume Right	0	0	0	0	29
cSH	1700	1700	1325	1700	874
Volume to Capacity	0.04	0.00	0.01	0.01	0.04
Queue Length 95th (ft)	0	0	1	0	3
Control Delay (s)	0.0	0.0	7.8	0.0	9.3
Lane LOS			A		A
Approach Delay (s)	0.0		3.9		9.3
Approach LOS					A

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	80	30	25	20	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	94	35	29	24	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	35				141	35
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	35				141	35
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1589				808	1043

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	6	94	35	29	24
Volume Left	6	0	0	0	24
Volume Right	0	0	0	29	0
cSH	1589	1700	1700	1700	796
Volume to Capacity	0.00	0.06	0.02	0.02	0.03
Queue Length 95th (ft)	0	0	0	0	2
Control Delay (s)	7.3	0.0	0.0	0.0	9.7
Lane LOS	A				A
Approach Delay (s)	0.4		0.0		9.7
Approach LOS					A

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	95	5	0	50	15	5	0	5	10	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	112	6	0	59	18	6	0	6	12	0	6
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	76			118			191	203	115	191	188	59
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	76			118			191	203	115	191	188	59
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.4	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.8	4.0	3.3
p0 queue free %	100			100			99	100	99	98	100	99
cM capacity (veh/h)	1535			1483			766	694	943	707	707	1013

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	124	0	59	18	12	12	6
Volume Left	6	0	0	0	6	12	0
Volume Right	6	0	0	18	6	0	6
cSH	1535	1700	1700	1700	846	707	1013
Volume to Capacity	0.00	0.00	0.03	0.01	0.01	0.02	0.01
Queue Length 95th (ft)	0	0	0	0	1	1	0
Control Delay (s)	0.4	0.0	0.0	0.0	9.3	10.2	8.6
Lane LOS	A				A	B	A
Approach Delay (s)	0.4	0.0			9.3	9.6	
Approach LOS					A	A	

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	24.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	20	90	45	595	510	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	21	93	46	613	526	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1232	526	546			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1232	526	546			
tC, single (s)	6.5	6.3	4.3			
tC, 2 stage (s)						
tF (s)	3.6	3.4	2.4			
p0 queue free %	89	83	95			
cM capacity (veh/h)	182	531	934			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	113	46	613	526	21
Volume Left	21	46	0	0	0
Volume Right	93	0	0	0	21
cSH	394	934	1700	1700	1700
Volume to Capacity	0.29	0.05	0.36	0.31	0.01
Queue Length 95th (ft)	29	4	0	0	0
Control Delay (s)	17.8	9.1	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	17.8	0.6		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	45	20	705	120	20	635
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1614	1488	1636	1430		1703
Flt Permitted	0.95	1.00	1.00	1.00		0.97
Satd. Flow (perm)	1614	1488	1636	1430		1660
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	46	21	727	124	21	655
RTOR Reduction (vph)	0	18	0	31	0	0
Lane Group Flow (vph)	46	3	727	93	0	676
Heavy Vehicles (%)	3%	0%	7%	4%	6%	7%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.7	5.7	34.4	34.4		34.4
Effective Green, g (s)	6.7	6.7	37.4	37.4		37.4
Actuated g/C Ratio	0.13	0.13	0.72	0.72		0.72
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	207	191	1174	1026		1191
v/s Ratio Prot	c0.03		c0.44			
v/s Ratio Perm		0.00		0.06		0.41
v/c Ratio	0.22	0.01	0.62	0.09		0.57
Uniform Delay, d1	20.4	19.8	3.7	2.2		3.5
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.5	0.0	1.5	0.1		1.1
Delay (s)	20.9	19.8	5.2	2.3		4.6
Level of Service	C	B	A	A		A
Approach Delay (s)	20.6		4.8			4.6
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	52.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	10	5	820	25	10	670
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	10	5	854	26	10	698
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1573	854			880	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1573	854			880	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	99			99	
cM capacity (veh/h)	121	361			776	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	16	854	26	708
Volume Left	10	0	0	10
Volume Right	5	0	26	0
cSH	181	1700	1700	776
Volume to Capacity	0.09	0.50	0.02	0.01
Queue Length 95th (ft)	7	0	0	1
Control Delay (s)	30.1	0.0	0.0	0.4
Lane LOS	D			A
Approach Delay (s)	30.1	0.0		0.4
Approach LOS	D			

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	53.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 20: Jordan Cove Rd & Transpacific

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	24	60
Average Queue (ft)	2	5
95th Queue (ft)	13	30
Link Distance (ft)		728
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: Transpacific & Horsfall Beach Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	76
Average Queue (ft)	17
95th Queue (ft)	50
Link Distance (ft)	909
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	2
Queuing Penalty (veh)	0

Intersection: 40: Transpacific & Boxcar Hill

Movement	EB	NB	SB	SB
Directions Served	LTR	LTR	L	TR
Maximum Queue (ft)	4	33	59	28
Average Queue (ft)	0	10	11	4
95th Queue (ft)	3	34	42	19
Link Distance (ft)	320	194		143
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)			25	
Storage Blk Time (%)			1	0
Queuing Penalty (veh)			0	0

Intersection: 50: US 101 & Transpacific

Movement	EB	NB	SB	SB
Directions Served	LR	L	T	R
Maximum Queue (ft)	211	100	3	8
Average Queue (ft)	62	26	0	0
95th Queue (ft)	142	67	3	7
Link Distance (ft)	2389		1561	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		500		100
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: US 101 & East Bay Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	70	48	277	125	434
Average Queue (ft)	28	16	108	30	130
95th Queue (ft)	60	47	239	94	317
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	13	3	5	0	
Queuing Penalty (veh)	3	1	6	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	SB
Directions Served	L	R	LT
Maximum Queue (ft)	38	38	195
Average Queue (ft)	8	8	18
95th Queue (ft)	28	33	96
Link Distance (ft)	317		495
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		25	
Storage Blk Time (%)	5	1	
Queuing Penalty (veh)	0	0	

Zone Summary

Zone wide Queuing Penalty: 11

Appendix E – 2018 Total Traffic Operations Worksheets, No Mitigation

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	12	0	0	15	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	14	0	0	18	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			14		32	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			14		32	14
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1617		987	1072

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	14	0	18	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1617	1700	1700
Volume to Capacity	0.01	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0		0.0	0.0	
Approach LOS				A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	10	2	24	11	4	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	2	28	13	5	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			14		81	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			14		81	12
tC, single (s)			4.4		7.4	6.8
tC, 2 stage (s)						
tF (s)			2.5		4.4	3.9
p0 queue free %			98		99	98
cM capacity (veh/h)			1445		713	918

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	12	2	28	13	20
Volume Left	0	0	28	0	5
Volume Right	0	2	0	0	15
cSH	1700	1700	1445	1700	860
Volume to Capacity	0.01	0.00	0.02	0.01	0.02
Queue Length 95th (ft)	0	0	1	0	2
Control Delay (s)	0.0	0.0	7.5	0.0	9.3
Lane LOS			A		A
Approach Delay (s)	0.0		5.2		9.3
Approach LOS					A

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	23	35	0	2	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	27	41	0	2	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	41				68	41
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	41				68	41
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1581				942	1036

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	27	41	0	2
Volume Left	0	0	0	0	2
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	824
Volume to Capacity	0.00	0.02	0.02	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	9.4
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.4
Approach LOS					A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	25	0	56	35	9	0	0	12	0	9	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	29	0	66	41	11	0	0	14	0	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	52			29			208	213	29	216	202	41
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	52			29			208	213	29	216	202	41
tC, single (s)	4.1			4.6			7.1	6.5	7.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.6			3.5	4.0	4.2	3.5	4.0	3.3
p0 queue free %	100			95			100	100	98	100	98	100
cM capacity (veh/h)	1567			1341			717	654	822	704	663	1036

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	29	66	41	11	14	0	11
Volume Left	0	66	0	0	0	0	0
Volume Right	0	0	0	11	14	0	0
cSH	1567	1341	1700	1700	822	1700	663
Volume to Capacity	0.00	0.05	0.02	0.01	0.02	0.00	0.02
Queue Length 95th (ft)	0	4	0	0	1	0	1
Control Delay (s)	0.0	7.8	0.0	0.0	9.5	0.0	10.5
Lane LOS		A			A	A	B
Approach Delay (s)	0.0	4.4			9.5	10.5	
Approach LOS					A	B	

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	21.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	7	30	84	151	210	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	8	35	99	178	247	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	622	247	265			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	622	247	265			
tC, single (s)	7.4	7.0	4.5			
tC, 2 stage (s)						
tF (s)	4.4	4.0	2.5			
p0 queue free %	97	94	91			
cM capacity (veh/h)	296	634	1117			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	44	99	178	247	18
Volume Left	8	99	0	0	0
Volume Right	35	0	0	0	18
cSH	521	1117	1700	1700	1700
Volume to Capacity	0.08	0.09	0.10	0.15	0.01
Queue Length 95th (ft)	7	7	0	0	0
Control Delay (s)	12.5	8.5	0.0	0.0	0.0
Lane LOS	B	A			
Approach Delay (s)	12.5	3.1		0.0	
Approach LOS	B				

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	58	10	244	14	4	267
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1525	1352	1423	1305		1452
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	1525	1352	1423	1305		1446
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	68	12	287	16	5	314
RTOR Reduction (vph)	0	10	0	6	0	0
Lane Group Flow (vph)	68	2	287	10	0	319
Heavy Vehicles (%)	9%	10%	23%	14%	0%	26%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.7	5.7	24.1	24.1		24.1
Effective Green, g (s)	6.7	6.7	27.1	27.1		27.1
Actuated g/C Ratio	0.16	0.16	0.65	0.65		0.65
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	244	216	922	846		937
v/s Ratio Prot	c0.04		0.20			
v/s Ratio Perm		0.00		0.01		c0.22
v/c Ratio	0.28	0.01	0.31	0.01		0.34
Uniform Delay, d1	15.4	14.8	3.2	2.6		3.3
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.6	0.0	0.4	0.0		0.5
Delay (s)	16.1	14.8	3.7	2.6		3.8
Level of Service	B	B	A	A		A
Approach Delay (s)	15.9		3.6			3.8
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	41.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	54	204	9	16	309
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	64	240	11	19	364
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	641	240			251	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	641	240			251	
tC, single (s)	6.4	6.4			4.8	
tC, 2 stage (s)						
tF (s)	3.5	3.5			2.9	
p0 queue free %	99	92			98	
cM capacity (veh/h)	434	748			986	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	68	240	11	382
Volume Left	5	0	0	19
Volume Right	64	0	11	0
cSH	803	1700	1700	986
Volume to Capacity	0.08	0.14	0.01	0.02
Queue Length 95th (ft)	7	0	0	1
Control Delay (s)	10.5	0.0	0.0	0.6
Lane LOS	B			A
Approach Delay (s)	10.5	0.0		0.6
Approach LOS	B			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 10: Transpacific & Entrance A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Jordan Cove Rd & Transpacific

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	12	57
Average Queue (ft)	0	6
95th Queue (ft)	6	33
Link Distance (ft)		728
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: Transpacific & Horsfall Beach Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	14
Average Queue (ft)	1
95th Queue (ft)	8
Link Distance (ft)	909
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 40: Transpacific & Boxcar Hill

Movement	WB	NB	SB
Directions Served	L	LTR	TR
Maximum Queue (ft)	61	80	27
Average Queue (ft)	5	16	7
95th Queue (ft)	30	58	24
Link Distance (ft)		194	143
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	100		
Storage Blk Time (%)	0		1
Queuing Penalty (veh)	0		0

Intersection: 50: US 101 & Transpacific

Movement	EB	NB	SB
Directions Served	LR	L	T
Maximum Queue (ft)	96	93	3
Average Queue (ft)	35	28	0
95th Queue (ft)	78	75	3
Link Distance (ft)	2389		1561
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		500	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 60: US 101 & East Bay Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	101	68	157	78	139
Average Queue (ft)	32	14	44	5	43
95th Queue (ft)	68	48	117	35	105
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	10	1	1	0	
Queuing Penalty (veh)	1	1	0	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	NB	SB
Directions Served	L	R	T	LT
Maximum Queue (ft)	46	79	4	85
Average Queue (ft)	4	38	0	7
95th Queue (ft)	24	67	3	44
Link Distance (ft)	317		622	495
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		25		
Storage Blk Time (%)	1	5		
Queuing Penalty (veh)	0	0		

Zone Summary

Zone wide Queuing Penalty: 3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	58	0	0	16	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	68	0	0	19	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			68		87	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		87	68
tC, single (s)			5.1		6.4	6.5
tC, 2 stage (s)						
tF (s)			3.1		3.5	3.6
p0 queue free %			100		100	100
cM capacity (veh/h)			1086		919	910

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	68	0	19	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1086	1700	1700
Volume to Capacity	0.04	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0		0.0	0.0	
Approach LOS				A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	58	0	14	14	2	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	68	0	16	16	2	29
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			68		118	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		118	68
tC, single (s)			4.5		7.4	6.5
tC, 2 stage (s)						
tF (s)			2.5		4.4	3.6
p0 queue free %			99		100	97
cM capacity (veh/h)			1342		681	927

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	68	0	16	16	32
Volume Left	0	0	16	0	2
Volume Right	0	0	0	0	29
cSH	1700	1700	1342	1700	903
Volume to Capacity	0.04	0.00	0.01	0.01	0.04
Queue Length 95th (ft)	0	0	1	0	3
Control Delay (s)	0.0	0.0	7.7	0.0	9.1
Lane LOS			A		A
Approach Delay (s)	0.0		3.9		9.1
Approach LOS					A

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	80	28	25	18	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	4	94	33	29	21	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	33				134	33
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	33				134	33
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1592				813	1046

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	4	94	33	29	21
Volume Left	4	0	0	0	21
Volume Right	0	0	0	29	0
cSH	1592	1700	1700	1700	799
Volume to Capacity	0.00	0.06	0.02	0.02	0.03
Queue Length 95th (ft)	0	0	0	0	2
Control Delay (s)	7.3	0.0	0.0	0.0	9.6
Lane LOS	A				A
Approach Delay (s)	0.3		0.0		9.6
Approach LOS					A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	94	2	13	47	11	2	13	73	21	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	2	111	2	15	55	13	2	15	86	25	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	68			113			207	215	112	296	204	55
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	68			113			207	215	112	296	204	55
tC, single (s)	4.1			5.1			7.1	6.5	6.6	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			3.1			3.5	4.0	3.6	3.6	4.0	3.3
p0 queue free %	100			99			100	98	90	96	100	100
cM capacity (veh/h)	1546			1038			742	675	852	559	685	1017

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	115	15	55	13	104	25	5
Volume Left	2	15	0	0	2	25	0
Volume Right	2	0	0	13	86	0	5
cSH	1546	1038	1700	1700	818	559	1017
Volume to Capacity	0.00	0.01	0.03	0.01	0.13	0.04	0.00
Queue Length 95th (ft)	0	1	0	0	11	3	0
Control Delay (s)	0.2	8.5	0.0	0.0	10.0	11.7	8.6
Lane LOS	A	A			B	B	A
Approach Delay (s)	0.2	1.6			10.0	11.2	
Approach LOS					B	B	

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	24	163	55	595	510	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	25	168	57	613	526	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1253	526	542			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1253	526	542			
tC, single (s)	6.7	6.5	4.5			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.6			
p0 queue free %	84	67	93			
cM capacity (veh/h)	153	504	860			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	193	57	613	526	16
Volume Left	25	57	0	0	0
Volume Right	168	0	0	0	16
cSH	390	860	1700	1700	1700
Volume to Capacity	0.49	0.07	0.36	0.31	0.01
Queue Length 95th (ft)	66	5	0	0	0
Control Delay (s)	22.9	9.5	0.0	0.0	0.0
Lane LOS	C	A			
Approach Delay (s)	22.9	0.8		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	41	16	716	118	19	707
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1630	1488	1620	1444		1659
Flt Permitted	0.95	1.00	1.00	1.00		0.98
Satd. Flow (perm)	1630	1488	1620	1444		1622
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	42	16	738	122	20	729
RTOR Reduction (vph)	0	14	0	29	0	0
Lane Group Flow (vph)	42	2	738	93	0	749
Heavy Vehicles (%)	2%	0%	8%	3%	5%	10%
Turn Type	Prot	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.7	5.7	35.8	35.8		35.8
Effective Green, g (s)	6.7	6.7	38.8	38.8		38.8
Actuated g/C Ratio	0.13	0.13	0.73	0.73		0.73
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	204	186	1174	1047		1176
v/s Ratio Prot	c0.03		0.46			
v/s Ratio Perm		0.00		0.06		c0.46
v/c Ratio	0.21	0.01	0.63	0.09		0.64
Uniform Delay, d1	21.0	20.5	3.7	2.2		3.8
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.5	0.0	1.6	0.1		1.6
Delay (s)	21.5	20.5	5.3	2.2		5.4
Level of Service	C	C	A	A		A
Approach Delay (s)	21.2		4.8			5.4
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	17	817	21	74	674
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	8	18	851	22	77	702
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1707	851			873	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1707	851			873	
tC, single (s)	6.4	7.0			4.3	
tC, 2 stage (s)						
tF (s)	3.5	4.0			2.4	
p0 queue free %	91	93			89	
cM capacity (veh/h)	90	268			705	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	26	851	22	779
Volume Left	8	0	0	77
Volume Right	18	0	22	0
cSH	282	1700	1700	705
Volume to Capacity	0.09	0.50	0.01	0.11
Queue Length 95th (ft)	8	0	0	9
Control Delay (s)	28.8	0.0	0.0	2.9
Lane LOS	D			A
Approach Delay (s)	28.8	0.0		2.9
Approach LOS	D			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	0	0	95	0	0	25
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	103	0	0	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	130	103			103	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	130	103			103	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	864	952			1489	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	103	27
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1489
Volume to Capacity	0.00	0.06	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	9.2%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 10: Transpacific & Entrance A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Jordan Cove Rd & Transpacific

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	13	58
Average Queue (ft)	0	4
95th Queue (ft)	7	26
Link Distance (ft)		728
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: Transpacific & Horsfall Beach Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	55
Average Queue (ft)	14
95th Queue (ft)	43
Link Distance (ft)	909
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	1
Queuing Penalty (veh)	0

Intersection: 40: Transpacific & Boxcar Hill

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	L	LTR	L	TR
Maximum Queue (ft)	8	33	96	54	28
Average Queue (ft)	0	3	46	13	4
95th Queue (ft)	5	24	83	39	19
Link Distance (ft)	320		194		143
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100		25	
Storage Blk Time (%)		0		2	0
Queuing Penalty (veh)		0		0	0

Intersection: 50: US 101 & Transpacific

Movement	EB	NB	SB
Directions Served	LR	L	T
Maximum Queue (ft)	338	110	17
Average Queue (ft)	118	34	1
95th Queue (ft)	299	83	9
Link Distance (ft)	2389		1561
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		500	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 60: US 101 & East Bay Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	65	46	329	125	507
Average Queue (ft)	24	14	106	28	156
95th Queue (ft)	53	44	241	95	383
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	10	3	5	0	
Queuing Penalty (veh)	2	1	6	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	NB	NB	SB	B1
Directions Served	L	R	T	R	LT	T
Maximum Queue (ft)	63	85	4	4	548	142
Average Queue (ft)	10	23	0	0	162	7
95th Queue (ft)	44	68	4	3	422	76
Link Distance (ft)	317		622	622	495	5290
Upstream Blk Time (%)					1	
Queuing Penalty (veh)					8	
Storage Bay Dist (ft)		25				
Storage Blk Time (%)	9	4				
Queuing Penalty (veh)	2	0				

Appendix F – 2018 Total Traffic Operations Worksheets, With Mitigation

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	12	0	0	15	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	14	0	0	18	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			14		32	14
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			14		32	14
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1617		987	1072

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	14	0	18	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1617	1700	1700
Volume to Capacity	0.01	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0		0.0	0.0	
Approach LOS				A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	10	2	24	11	4	13
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	2	28	13	5	15
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			14		81	12
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			14		81	12
tC, single (s)			4.4		7.4	6.8
tC, 2 stage (s)						
tF (s)			2.5		4.4	3.9
p0 queue free %			98		99	98
cM capacity (veh/h)			1445		713	918

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	12	2	28	13	20
Volume Left	0	0	28	0	5
Volume Right	0	2	0	0	15
cSH	1700	1700	1445	1700	860
Volume to Capacity	0.01	0.00	0.02	0.01	0.02
Queue Length 95th (ft)	0	0	1	0	2
Control Delay (s)	0.0	0.0	7.5	0.0	9.3
Lane LOS			A		A
Approach Delay (s)	0.0		5.2		9.3
Approach LOS					A

Intersection Summary			
Average Delay	5.3		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	0	23	35	0	2	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	27	41	0	2	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	41				68	41
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	41				68	41
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1581				942	1036

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	0	27	41	0	2
Volume Left	0	0	0	0	2
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	824
Volume to Capacity	0.00	0.02	0.02	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	9.4
Lane LOS					A
Approach Delay (s)	0.0		0.0		9.4
Approach LOS					A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	25	0	56	35	9	0	0	12	0	9	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	29	0	66	41	11	0	0	14	0	11	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	52			29			208	213	29	216	202	41
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	52			29			208	213	29	216	202	41
tC, single (s)	4.1			4.6			7.1	6.5	7.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.6			3.5	4.0	4.2	3.5	4.0	3.3
p0 queue free %	100			95			100	100	98	100	98	100
cM capacity (veh/h)	1567			1341			717	654	822	704	663	1036

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	29	66	41	11	14	0	11
Volume Left	0	66	0	0	0	0	0
Volume Right	0	0	0	11	14	0	0
cSH	1567	1341	1700	1700	822	1700	663
Volume to Capacity	0.00	0.05	0.02	0.01	0.02	0.00	0.02
Queue Length 95th (ft)	0	4	0	0	1	0	1
Control Delay (s)	0.0	7.8	0.0	0.0	9.5	0.0	10.5
Lane LOS		A			A	A	B
Approach Delay (s)	0.0	4.4			9.5	10.5	
Approach LOS					A	B	

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	21.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	7	30	84	151	210	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	8	35	99	178	247	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	622	247	265			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	622	247	265			
tC, single (s)	7.4	7.0	4.5			
tC, 2 stage (s)						
tF (s)	4.4	4.0	2.5			
p0 queue free %	97	94	91			
cM capacity (veh/h)	296	634	1117			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	8	35	99	178	247	18
Volume Left	8	0	99	0	0	0
Volume Right	0	35	0	0	0	18
cSH	296	634	1117	1700	1700	1700
Volume to Capacity	0.03	0.06	0.09	0.10	0.15	0.01
Queue Length 95th (ft)	2	4	7	0	0	0
Control Delay (s)	17.5	11.0	8.5	0.0	0.0	0.0
Lane LOS	C	B	A			
Approach Delay (s)	12.2		3.1		0.0	
Approach LOS	B					

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	30.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	58	10	244	14	4	267
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1525	1352	1423	1305		1452
Flt Permitted	0.95	1.00	1.00	1.00		1.00
Satd. Flow (perm)	1525	1352	1423	1305		1446
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	68	12	287	16	5	314
RTOR Reduction (vph)	0	10	0	6	0	0
Lane Group Flow (vph)	68	2	287	10	0	319
Heavy Vehicles (%)	9%	10%	23%	14%	0%	26%
Turn Type	NA	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.7	5.7	24.1	24.1		24.1
Effective Green, g (s)	6.7	6.7	27.1	27.1		27.1
Actuated g/C Ratio	0.16	0.16	0.65	0.65		0.65
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	244	216	922	846		937
v/s Ratio Prot	c0.04		0.20			
v/s Ratio Perm		0.00		0.01		c0.22
v/c Ratio	0.28	0.01	0.31	0.01		0.34
Uniform Delay, d1	15.4	14.8	3.2	2.6		3.3
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.6	0.0	0.4	0.0		0.5
Delay (s)	16.1	14.8	3.7	2.6		3.8
Level of Service	B	B	A	A		A
Approach Delay (s)	15.9		3.6			3.8
Approach LOS	B		A			A

Intersection Summary			
HCM 2000 Control Delay	5.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	41.8	Sum of lost time (s)	8.0
Intersection Capacity Utilization	29.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	4	54	204	9	16	309
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	64	240	11	19	364
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	641	240			251	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	641	240			251	
tC, single (s)	6.4	6.4			4.8	
tC, 2 stage (s)						
tF (s)	3.5	3.5			2.9	
p0 queue free %	99	92			98	
cM capacity (veh/h)	434	748			986	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	68	240	11	382
Volume Left	5	0	0	19
Volume Right	64	0	11	0
cSH	803	1700	1700	986
Volume to Capacity	0.08	0.14	0.01	0.02
Queue Length 95th (ft)	7	0	0	1
Control Delay (s)	10.5	0.0	0.0	0.6
Lane LOS	B			A
Approach Delay (s)	10.5	0.0		0.6
Approach LOS	B			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	39.3%	ICU Level of Service	A
Analysis Period (min)	15		

Intersection: 10: Transpacific & Entrance A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Jordan Cove Rd & Transpacific

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	10	52
Average Queue (ft)	0	5
95th Queue (ft)	4	30
Link Distance (ft)		728
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: Transpacific & Horsfall Beach Rd

Movement	SB
Directions Served	L
Maximum Queue (ft)	24
Average Queue (ft)	1
95th Queue (ft)	9
Link Distance (ft)	909
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 40: Boxcar Hill & Transpacific

Movement	WB	NB	SB
Directions Served	L	LTR	TR
Maximum Queue (ft)	44	80	28
Average Queue (ft)	2	16	5
95th Queue (ft)	23	59	21
Link Distance (ft)		194	143
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	100		
Storage Blk Time (%)	0		1
Queuing Penalty (veh)	0		0

Intersection: 50: US 101 & Transpacific

Movement	EB	EB	NB	SB
Directions Served	L	R	L	R
Maximum Queue (ft)	77	82	106	4
Average Queue (ft)	8	25	29	0
95th Queue (ft)	38	69	78	3
Link Distance (ft)		2386		
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	200		500	100
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 60: US 101 & East Bay Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	128	51	153	52	171
Average Queue (ft)	42	11	36	3	37
95th Queue (ft)	92	41	107	28	105
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	25	1	1	0	
Queuing Penalty (veh)	2	1	0	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	51	85	3	4	94
Average Queue (ft)	6	36	0	0	9
95th Queue (ft)	30	69	3	3	55
Link Distance (ft)	317		622	622	495
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25			
Storage Blk Time (%)	1	5			
Queuing Penalty (veh)	0	0			

Zone Summary

Zone wide Queuing Penalty: 4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	58	0	0	16	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	68	0	0	19	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			68		87	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		87	68
tC, single (s)			5.1		6.4	6.5
tC, 2 stage (s)						
tF (s)			3.1		3.5	3.6
p0 queue free %			100		100	100
cM capacity (veh/h)			1086		919	910

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2
Volume Total	68	0	19	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1086	1700	1700
Volume to Capacity	0.04	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0		0.0	0.0	
Approach LOS				A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	7.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	58	0	14	14	2	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	68	0	16	16	2	29
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			68		118	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			68		118	68
tC, single (s)			4.5		7.4	6.5
tC, 2 stage (s)						
tF (s)			2.5		4.4	3.6
p0 queue free %			99		100	97
cM capacity (veh/h)			1342		681	927

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	68	0	16	16	32
Volume Left	0	0	16	0	2
Volume Right	0	0	0	0	29
cSH	1700	1700	1342	1700	903
Volume to Capacity	0.04	0.00	0.01	0.01	0.04
Queue Length 95th (ft)	0	0	1	0	3
Control Delay (s)	0.0	0.0	7.7	0.0	9.1
Lane LOS			A		A
Approach Delay (s)	0.0		3.9		9.1
Approach LOS					A

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	17.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	3	80	28	25	18	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	4	94	33	29	21	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						1
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	33				134	33
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	33				134	33
tC, single (s)	4.1				6.6	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.7	3.3
p0 queue free %	100				97	100
cM capacity (veh/h)	1592				813	1046

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	SB 1
Volume Total	4	94	33	29	21
Volume Left	4	0	0	0	21
Volume Right	0	0	0	29	0
cSH	1592	1700	1700	1700	799
Volume to Capacity	0.00	0.06	0.02	0.02	0.03
Queue Length 95th (ft)	0	0	0	0	2
Control Delay (s)	7.3	0.0	0.0	0.0	9.6
Lane LOS	A				A
Approach Delay (s)	0.3		0.0		9.6
Approach LOS					A

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	15.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	2	94	2	13	47	11	2	13	73	21	0	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	2	111	2	15	55	13	2	15	86	25	0	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	68			113			207	215	112	296	204	55
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	68			113			207	215	112	296	204	55
tC, single (s)	4.1			5.1			7.1	6.5	6.6	7.2	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			3.1			3.5	4.0	3.6	3.6	4.0	3.3
p0 queue free %	100			99			100	98	90	96	100	100
cM capacity (veh/h)	1546			1038			742	675	852	559	685	1017

Direction, Lane #	EB 1	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	115	15	55	13	104	25	5
Volume Left	2	15	0	0	2	25	0
Volume Right	2	0	0	13	86	0	5
cSH	1546	1038	1700	1700	818	559	1017
Volume to Capacity	0.00	0.01	0.03	0.01	0.13	0.04	0.00
Queue Length 95th (ft)	0	1	0	0	11	3	0
Control Delay (s)	0.2	8.5	0.0	0.0	10.0	11.7	8.6
Lane LOS	A	A			B	B	A
Approach Delay (s)	0.2	1.6			10.0	11.2	
Approach LOS					B	B	

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	26.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	24	163	55	595	510	16
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97
Hourly flow rate (vph)	25	168	57	613	526	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1253	526	542			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1253	526	542			
tC, single (s)	6.7	6.5	4.5			
tC, 2 stage (s)						
tF (s)	3.8	3.6	2.6			
p0 queue free %	84	67	93			
cM capacity (veh/h)	153	504	860			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	168	57	613	526	16
Volume Left	25	0	57	0	0	0
Volume Right	0	168	0	0	0	16
cSH	153	504	860	1700	1700	1700
Volume to Capacity	0.16	0.33	0.07	0.36	0.31	0.01
Queue Length 95th (ft)	14	36	5	0	0	0
Control Delay (s)	32.9	15.7	9.5	0.0	0.0	0.0
Lane LOS	D	C	A			
Approach Delay (s)	17.9		0.8		0.0	
Approach LOS	C					

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	41	16	716	118	19	707
Ideal Flow (vphpl)	1750	1750	1750	1750	1825	1825
Total Lost time (s)	4.0	4.0	4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00		1.00
Frt	1.00	0.85	1.00	0.85		1.00
Flt Protected	0.95	1.00	1.00	1.00		1.00
Satd. Flow (prot)	1630	1488	1620	1444		1659
Flt Permitted	0.95	1.00	1.00	1.00		0.98
Satd. Flow (perm)	1630	1488	1620	1444		1622
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	42	16	738	122	20	729
RTOR Reduction (vph)	0	14	0	29	0	0
Lane Group Flow (vph)	42	2	738	93	0	749
Heavy Vehicles (%)	2%	0%	8%	3%	5%	10%
Turn Type	NA	Perm	NA	Perm	Perm	NA
Protected Phases	8		2			6
Permitted Phases		8		2	6	
Actuated Green, G (s)	5.7	5.7	35.8	35.8		35.8
Effective Green, g (s)	6.7	6.7	38.8	38.8		38.8
Actuated g/C Ratio	0.13	0.13	0.73	0.73		0.73
Clearance Time (s)	5.0	5.0	7.0	7.0		7.0
Vehicle Extension (s)	3.0	3.0	5.2	5.2		5.2
Lane Grp Cap (vph)	204	186	1174	1047		1176
v/s Ratio Prot	c0.03		0.46			
v/s Ratio Perm		0.00		0.06		c0.46
v/c Ratio	0.21	0.01	0.63	0.09		0.64
Uniform Delay, d1	21.0	20.5	3.7	2.2		3.8
Progression Factor	1.00	1.00	1.00	1.00		1.00
Incremental Delay, d2	0.5	0.0	1.6	0.1		1.6
Delay (s)	21.5	20.5	5.3	2.2		5.4
Level of Service	C	C	A	A		A
Approach Delay (s)	21.2		4.8			5.4
Approach LOS	C		A			A

Intersection Summary			
HCM 2000 Control Delay	5.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	53.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	8	17	817	21	74	674
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	8	18	851	22	77	702
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		1				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1707	851			873	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1707	851			873	
tC, single (s)	6.4	7.0			4.3	
tC, 2 stage (s)						
tF (s)	3.5	4.0			2.4	
p0 queue free %	91	93			89	
cM capacity (veh/h)	90	268			705	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	26	851	22	779
Volume Left	8	0	0	77
Volume Right	18	0	22	0
cSH	282	1700	1700	705
Volume to Capacity	0.09	0.50	0.01	0.11
Queue Length 95th (ft)	8	0	0	9
Control Delay (s)	28.8	0.0	0.0	2.9
Lane LOS	D			A
Approach Delay (s)	28.8	0.0		2.9
Approach LOS	D			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	95.9%	ICU Level of Service	F
Analysis Period (min)	15		

Intersection: 10: Transpacific & Entrance A

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 20: Jordan Cove Rd & Transpacific

Movement	WB	NB
Directions Served	L	LR
Maximum Queue (ft)	18	39
Average Queue (ft)	1	2
95th Queue (ft)	13	17
Link Distance (ft)		728
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	75	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 30: Transpacific /Transpacific & Horsfall Beach Rd

Movement	EB	SB
Directions Served	L	L
Maximum Queue (ft)	8	58
Average Queue (ft)	0	12
95th Queue (ft)	5	41
Link Distance (ft)		909
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	90	
Storage Blk Time (%)		1
Queuing Penalty (veh)		0

Intersection: 40: Boxcar Hill & Transpacific

Movement	EB	WB	NB	SB	SB
Directions Served	LTR	L	LTR	L	TR
Maximum Queue (ft)	9	70	113	48	24
Average Queue (ft)	0	3	49	14	3
95th Queue (ft)	6	28	89	39	16
Link Distance (ft)	320		194		143
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100		25	
Storage Blk Time (%)		0		2	0
Queuing Penalty (veh)		0		0	0

Intersection: 50: US 101 & Transpacific

Movement	EB	EB	NB	SB	SB
Directions Served	L	R	L	T	R
Maximum Queue (ft)	102	101	104	4	13
Average Queue (ft)	26	56	35	0	0
95th Queue (ft)	72	91	82	0	8
Link Distance (ft)		2386		1561	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	200		500		100
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 60: US 101 & East Bay Rd

Movement	WB	WB	NB	NB	SB
Directions Served	L	R	T	R	LT
Maximum Queue (ft)	81	48	257	125	407
Average Queue (ft)	29	16	87	19	122
95th Queue (ft)	67	48	213	76	317
Link Distance (ft)	710		5290		895
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		25		100	
Storage Blk Time (%)	26	4	4	0	
Queuing Penalty (veh)	4	1	4	0	

Intersection: 70: US 101 & Ferry Rd

Movement	WB	WB	NB	NB	SB	B1
Directions Served	L	R	T	R	LT	T
Maximum Queue (ft)	100	87	186	98	504	204
Average Queue (ft)	12	24	4	3	170	12
95th Queue (ft)	55	72	77	77	424	134
Link Distance (ft)	317		622	622	495	5290
Upstream Blk Time (%)			0	0	2	
Queuing Penalty (veh)			0	0	12	
Storage Bay Dist (ft)		25				
Storage Blk Time (%)	8	5				
Queuing Penalty (veh)	1	0				

APPENDIX U-5

Impact of the Jordan Cove Energy Project Construction on Coos County Housing and Schools

The Impact of the Jordan Cove Energy Project Construction Personnel on Coos County Housing and Schools

An Analysis Prepared for the Jordan Cove Energy Project, LP

By: Robert Whelan

November 15, 2006

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Introduction

The Jordan Cove Energy Project, L. P. retained ECONorthwest to estimate the impacts their project would have on housing and school enrollment in Coos County, Oregon during the project's construction. This white paper summarizes the findings of that analysis.

The Jordan Cove Energy Project ("JCEP") entails the construction of a liquefied natural gas ("LNG") import terminal on 170 acres of industrial land on the North Spit of Coos Bay. Construction would begin in January 2008 and take 36 months to complete.

During the construction phase, monthly employment on the jobsite would average 430 workers. However, in the peak month, June 2009, there would be 929 employees. Some would commute daily to the construction project from their permanent residences, but others would move, albeit temporarily, to the Coos Bay area to be closer to their workplace.

This report is an analysis that estimates the impact of the construction workers on housing and schools in Coos County. It is organized as follows:

- A review of the number and types of workers that would be employed during the construction phase begins on page 3.
- The analysis of where employees would come from starts on page 6.
- A baseline forecast was made for dwelling capacity—both permanent and temporary. This includes a forecast of Coos County housing in 2009, which is shown on page 13. A projection of the supply of hotel and motel rooms within a 35-mile radius of the job site was prepared and can be found on page 14. Finally, as construction crews also rely on other forms of temporary housing, there are estimates of the supply of recreational vehicle ("RV") sites and manufactured home parks in on pages 17 and 18, respectively.
- The impact of construction worker families on schools is discussed in Section IV, which begins on page 20.

Major Findings

The analysis used data from various industry and government sources in conjunction with work plans provided by the construction-engineering firm that would build the JCEP terminal. From this analysis, the following major conclusions were made:

- Over the 36-month course of construction, an estimated 1,100 jobs lasting an average of 14 months would be created. With normal turnover taken into account, the average employee at the jobsite would work there for about 10.4 months.

- There is a large qualified labor supply living within a four hour driving distance from the jobsite. Most craft unions report that they would have adequate supplies of members available for the JCEP. Furthermore, a decline in major nonresidential construction activity is forecast for Oregon. As a consequence, the number of available workers in the region is going to increase as construction activity at the JCEP ramps up.

- An analysis of housing and temporary lodging capacity in Coos County indicates that there is ample supply and that the communities closest to the jobsite, North Bend and Coos Bay, would easily be able to accommodate the influx of workers.

- JCEP is within the North Bend School District. It and other nearby districts would see less than a one-percent increase in enrollment during the construction phase. The North Bend District has ample capacity to accommodate the additional students. It would receive direct contributions from the JCEP and additional funding from the State of Oregon to more than fully pay for the increased enrollment.

Employment

The first step of the analysis is to forecast the employment pattern at the construction jobsite and then ascertain how many workers would move to the Coos Bay area.

Construction Project

Black & Veatch will oversee the building of the LNG terminal for the JCEP. It would be built under a labor agreement with the local building trades, using local union labor to the greatest extent possible.

Black & Veatch is a global engineering and construction firm, which specializes in large-scale energy and infrastructure projects including some in Oregon. For example, they built a 500-megawatt cogeneration plant in Klamath Falls, Oregon in 1999 – 2001[1] and are working on a 400-megawatt plant in Columbia County, Oregon,[2] which is under construction presently.

Employment Forecast

For the JCEP, Black & Veatch provided their employment schedule for management, staff, and various construction trades that would be working at the JCEP jobsite. They also provided notes on their conversations with trade unions regarding their capacity to provide skilled workers to the jobsite.

Monthly Average Employment

It is anticipated that the entire project would run 36 months starting in January 2008 and concluding in December 2010. As shown in Figure 1, employment at the JCEP would start with twelve employees in the first month and then rise to a peak of 929, which, according to the current schedule, would occur in June 2009. Employment would then decline until its conclusion 18 months later. This bell-shaped pattern of employment is normal for large, complex construction projects.

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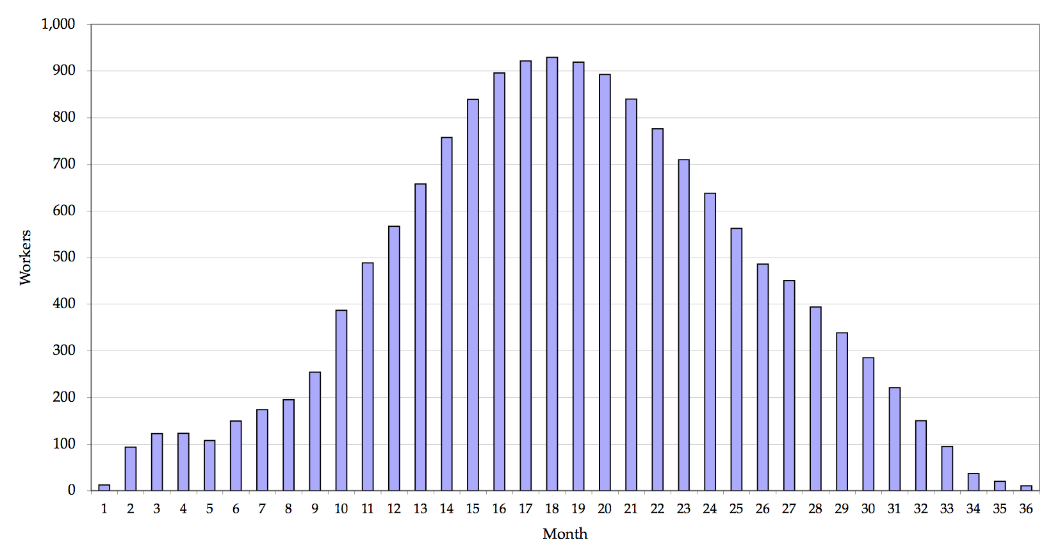
[1] Kuenzi, M. and Vasey, T. Cogen project fueled by innovation and collaboration, Power Engineering. July 1, 2001. Page 51.

[2] Culverwell, W. Black & Veatch leads effort on Clatskanie Power Plant. Portland Business Journal. August 5, 2005.

Figure 1: Monthly Workforce at the JCEP Jobsite, January 2008 Through December 2010



Source: Black & Veatch analysis dated September 14, 2006 and updated construction start date provided by the JCEP on November 9, 2006.

As is typical of such projects, many different job skills would be necessary at the JCEP, but virtually none would be needed over the entire course of construction. As shown in Table 1, there is a wide range of crafts involved. Although an average of 430 people would be working onsite each month, workers of different crafts would be needed at different times.

Table 1: Employment by Occupation, Average Number of Workers per Month of Construction

Occupation or Craft	Monthly Avg. # of Workers
Direct craft labor:	
Site work	11
Concrete	90
Piping	50
Arch & Metals	12
BOP/Mechanical Equipment	22
LNG tank erection	111
Electrical/I&C	40
Insulation	6
Subtotal, direct craft labor	342
Indirect support craft labor	51
Const. management & staff	37
Total average employment	430

Source: Black & Veatch.

Indeed some jobs would be required for only a few months. While the demand for workers in different crafts may overlap, the employment of others will not. Those engaged in site preparation work, for example, would be long gone by the time pipefitters come onto the job. Consequently, the employment pattern in Figure 1 reflects a series of new jobs starting and old jobs ending every month rather than continuous employment for several hundred people.

Employment is a measurement of the amount of work for a specific job and is not a count of individuals, which is what is relevant when forecasting the demand for housing and schools. Because of normal turnover, more than one person can work at one job during the months that it is needed at the construction project.

Average Length of Employment Per Individual

To calculate the length of time that the average person working at the jobsite would be employed, turnover from people quitting or otherwise leaving before their positions end must be considered. Such normal employee turnover results in the number of individuals, that would at one time or another work on the project, to exceed the total number of jobs.

Table 2 demonstrates this. Although during the average month of construction, 430 people would be working on the JCEP construction site, over the entire 36 months, an estimated 1,110 jobs at varying times would need to be filled and the average job would last 14 months. However, according to the most recent U.S. Department of Labor statistics, 2.1 percent of construction workers quit their jobs each month. That turnover rate, when applied to the data supplied by Black & Veatch, shows that the average individual taking a job at the construction site in Coos County would be there for 10.4 months—roughly 45 weeks.

Table 2: Labor Indicators

Indicator	Value	Unit
Time of construction at jobsite	36	Months
Minimum employment (December 2010)	10	Positions employed in month
Maximum employment (July 2009)	929	Positions employed in month
Average employment	430	Positions employed in month
Number of jobs	1,110	Unique positions over entire construction period
Average length of each job	14.0	Months of work on jobsite per position
Monthly quit rate	2.1%	Percent of positions held*
Forecast length of stay per employee	10.4	Months at the jobsite for average employee

** Average quit turnover rate of construction jobs in the United States.*
Sources: Analysis by ECONorthwest of Black & Veatch workbook and the U.S. Department of Labor, Bureau of Labor Statistics "Job Openings and Labor Turnover: August 2006."

Source of Construction Employees

Normally, on large construction projects in Oregon, workers will commute to the jobsite from their homes. If commuting times are exceptionally long, workers will take up weekday residency in transient lodging such as motels, RV parks, rental housing, and the like, and then commute on weekends.

If the required job skills call for bringing in hard-to-find specially trained workers, such as field staff, managers, tank welders, and crafts experienced in marine projects, it is common to have employees temporarily relocate from out of state. However, because the average job would last only 10.4 months, it is anticipated that non-local employees overwhelmingly would prefer not to move their families to Coos County.

This was the experience during the construction of the 60-mile Coos Bay pipeline project in 2003, which employed 350 during its peak. Pipeline work is specialized and there is comparatively little of it in Oregon. Half the workers for the Coos Bay pipeline came from out of state.[3] This was reflected in population statistics for Coos County, which showed an anomalous rise in 2003. However, although the construction extended into the school year, public school enrollment in Coos County fell by 155—indicating that few, if any, traveling construction workers brought their families to the County. According to Black & Veatch, their major construction projects in Klamath Falls and Columbia County (previously cited on page 3) have had negligible impacts on schools.

Although there is a relative dearth of construction labor, especially for industrial projects, in Coos County, there are deep labor pools in surrounding areas. Many capable construction workers reside in Oregon and are less than a four-hour drive from of the JCEP jobsite.

Table 3 illustrates the potential. In May 2005, the Bureau of Labor Statistics reported that there were 71,970 people employed in Oregon in construction occupations—both labor and management. In Lane County alone, which is within daily commuting distance of Coos Bay, there were 6,440.

[3] Coos Count y wants union firm to finish gas pipeline. Northwest Labor Press. June 4, 2004.

Table 3: Employees in Construction Occupations by Location in Oregon, May 2005

Oregon Counties	Major City	Travel Time to Coos Bay	Employed
Deschutes	Bend	4:26	4,510
Benton	Corvallis	2:53	920
Lane	Eugene	2:03	6,440
Jackson	Medford	3:27	3,480
Marion and Polk	Salem	3:12	7,480
Multnomah, Yamhill, Columbia, Clackamas & Washington*	Portland	3:56	40,480
Elsewhere in Oregon	-	-	8,660
Total Employees	-	-	71,970

Sources: U.S. Bureau of Labor Statistics occupational wage survey, May 2005. Travel times from Mapquest.
** Note: Portland metro area employment estimated by ECONorthwest by assuming 90 percent of the total employment was on the Oregon side of the metro area.*

Availability of Union Labor

Construction labor markets in Oregon in 2006 are very tight, especially in some of the highly skilled trades, which are in great demand in bridge, factory, utility, and high-rise building construction.

Black & Veatch called area unions and asked about current and projected work levels of their members. Table 4 summarizes what they were told. All but one that responded said that their members were busy, yet would still be able to staff the LNG project in Coos County. Evidence from another source suggests that the pace of heavy construction would be slowing in Oregon just when the JCEP project begins gearing up. This bodes well for in-state labor availability.

Table 4: Labor Union Survey, September 2006

Union	Active Members	Currently Working	Current & Upcoming Work
Asbestos Workers Local 36	200	180	No report
Boilermakers Local 500	200	150	No report
PNWRC of Carpenters	4,000	#N/A	Currently busy
PNWRC--Millwrights	250	180	Busy now, but would have no problem staffing LNG project
Iron Workers Local 29	200	186	Busy now, but would have no problem staffing LNG project
Laborers Local 121	500	340	Currently not busy
Operators Local 701	2,600	1,560	Would be available
Painters Local 1277	#N/A	#N/A	Currently busy
Pipefitters and Plumbers Local 290	4,000	3,760	Busy now, but would have no problem staffing LNG project
Cement Masons Local 555	450	450	Busy now and would have problem staffing LNG project
Sheet Metal Workers Local 16	#N/A	#N/A	No report
IB Electrical Workers Local 932	#N/A	#N/A	Busy now and could have problem staffing LNG project
Teamsters Local 206	#N/A	#N/A	No report

Source: Black & Veatch.

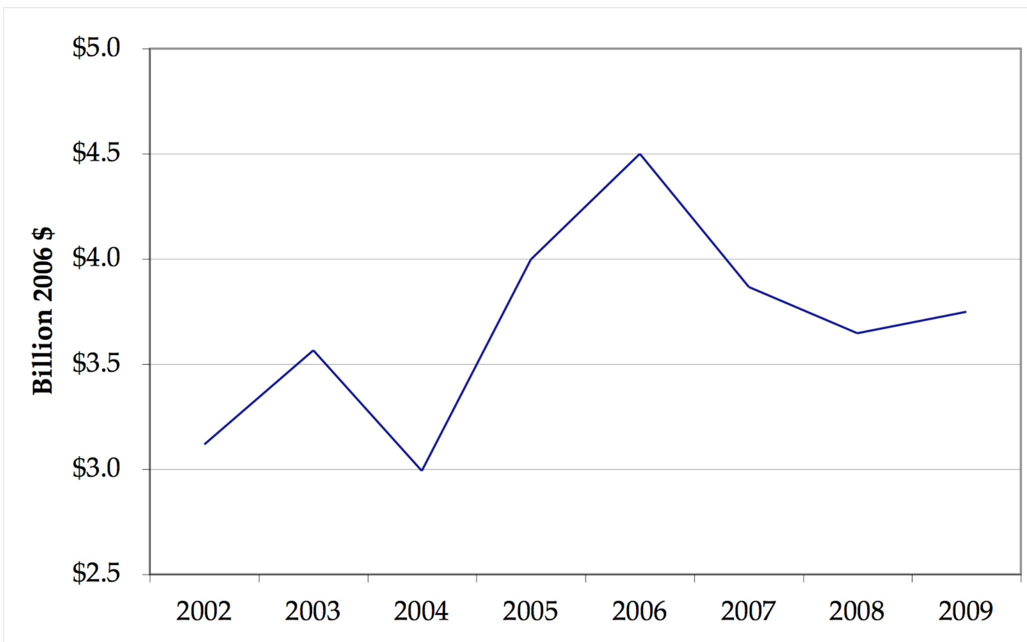
Outlook For Nonresidential Construction

To assess the likely degree of competition for workers, data from F.W. Dodge, which is a nationally recognized and respected source of construction contract data and forecasts, was assembled.

The JCEP project would draw labor primarily from crafts that work on infrastructure and nonresidential building construction. As such, nonresidential construction projects elsewhere in Oregon would compete for the available skilled labor supply. The greater the competition, the further out from Coos County the JCEP project would have to go to get workers.

Shown in Figure 2, is data on the value of nonresidential construction in Oregon, adjusted for inflation, for the last five years and the next three years. The data indicate that nonresidential construction in Oregon during 2006 is running at a high rate of $4.5 billion dollars—$1.5 billion greater than just two years ago. As a result, skilled construction labor in Oregon for large projects is tight.

Figure 2: Nonresidential Construction in Oregon, 2002 – 2009, in Billions of 2006 $



Sources: F.W. Dodge construction data adjusted for inflation using the Engineering News Record construction and building cost indices with forecast by ECONorthwest for 2009.

Although construction work is plentiful now, the data also show a near-term easing in the market. According to F.W. Dodge, nonresidential construction spending in the State is going to decline in 2007. By 2008, competition for workers from other projects (the Dodge data exclude the JCEP) would be 19 percent less than what it is currently.

Although a slight improvement is expected in 2009, the forecast indicates that the JCEP would have an easier time attracting local and regional commuting workers in 2009 than if the project was at peak construction today in 2006. The improved outlook for construction labor as indicated by a slowing in construction spending in Oregon suggests that the JCEP would be able to find many workers that could commute to the jobsite, thus, lessening the demand for dwelling units in Coos County.

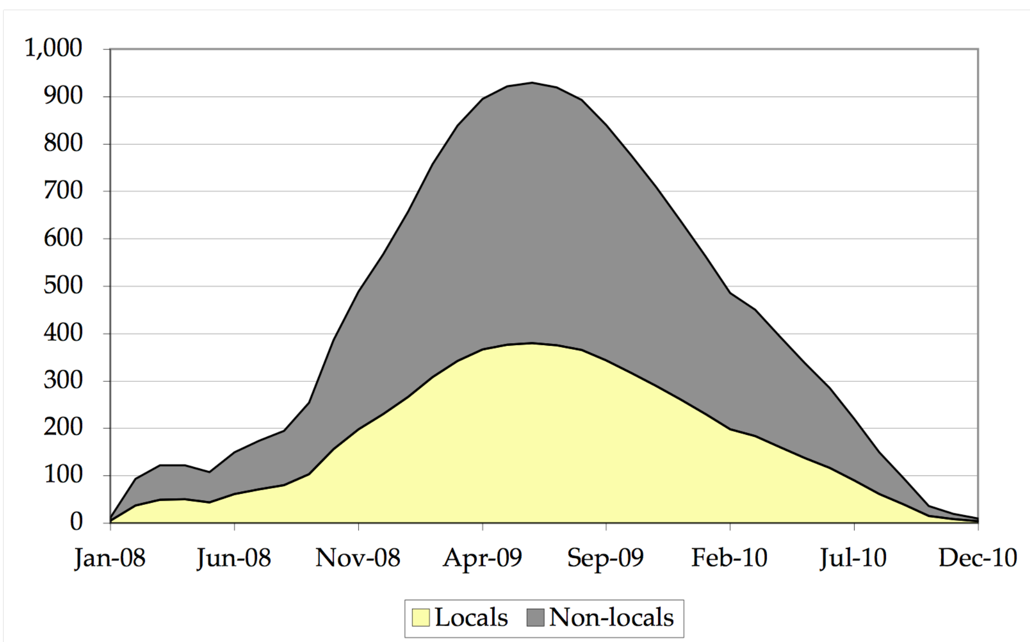
Number of Non-Locals

This analysis expects that the JCEP would be able to find about 41 percent of all its employees living close enough to Coos County to be able to commute daily between their homes and the jobsite. The others, which are described here as "non-locals," would either move to the Coos Bay area temporarily or take-up overnight lodging on weekdays while commuting in from their permanent residences on Sunday nights and returning to their homes on Fridays.

Based on its extensive experience with similar projects in mid-sized Oregon markets, Black & Veatch expects 60 percent of the craft workers and half the staff employees would be non-local and would require places to stay in Coos County.

An analysis of the JCEP staffing schedule finds that the number of non-local workers would average 255 a month during construction. As shown in Figure 3, peak employment of non-locals, totaling 549, would be reached in June 2009.

Figure 3: Monthly Local and Non-Local Employment at the JCEP



Sources: ECONorthwest analysis of employment data from Black & Veatch and the JCEP.

Over the entire course of the project, the analysis finds that 656 non-local individuals would work at the construction site and make use of transient lodging at some time in Coos County. The average length of stay, as noted from Table 2, would be 10.4 months.

Given the short duration of the work, the proximity of the area to more populous cities with larger construction markets (Table 3), and the paucity of heavy construction projects on the southern Oregon coast, few employees would move their families to Coos County for the construction jobs at the JCEP.

Forecast Influx of Non-Local Households

The U.S. Census defines a household as a place where one or more people lives in a housing unit. If a household has two or more people related by birth, marriage, or adoption, it is called a family. Generally, a person living in a place without a separate eating area occupies a "group-quarters" unit, according to the Census, and is not considered a household.

Workers moving to Coos County that would stay in motels, bed & breakfast places, and rented rooms in private housing would not be classified as households, but rather individuals living in group-quarters. Thus the title of Table 5 describes both households and those living in group-quarters.

Table 5: Household & Group Quarters Forecast

Living Arrangements of All Workers:	
Commute to jobsite daily	454
Move to Coos County with family	66
Move to Coos County alone	590
Total employees	1,110
Workers moving families to Coos County:	
Number of workers over 36 months	66
Unique family households*	64
Average households per month	24
Peak month (June 2009)	53
Workers moving without families:	
Number of workers over 36 months	590
Unique households & group quarter units*	572
Avg. households & group units per month	223
Peak month (June 2009)	479

** Six percent of workers would share places to stay.*
Source: ECONorthwest.

The analysis assumes that six-percent of all workers moving to the area would share living quarters with other JCEP employees, and that ten percent would also bring their families. Thus, over the entire construction period, 66 workers would move with their families, but this would result in slightly fewer (64) new family households in Coos County.

During the average month of construction there would be 24 additional family households in the County because of the JCEP. In the peak month of June 2009, there would be 53.

The analysis estimates that 590 workers would move, but not bring their families, to Coos County. Because some workers would double-up in their accommodations, the region would have to have places to temporarily house 572 over the 36-month period, albeit not at the same time. In the peak month, 479 places would be needed for non-families. These households and individuals in group-quarters mostly would occupy motels, RV parks, seasonal rental housing, apartments, and campgrounds.

Section III

Housing

Construction projects of the scale and specialization of the proposed LNG terminal draw workers from a wide area and, in doing so, place demand for dwelling units. Construction projects of this type are episodic and continuing work of similar pay in the area is speculative. Therefore, few workers coming to build the LNG terminal would permanently relocate to Coos County.

Since it is often impractical to buy housing that one would live in for less than a year, the average non-local worker is apt to rent existing housing units, stay in transient lodging, or use an RV or mobile home as a dwelling.

In Coos County, and especially in the towns and cities within a 35-mile radius of the JCEP job site, there are many temporary lodging choices. This is a direct consequence of the highly seasonal demand for places to stay along the Oregon coast. Coos County is a summertime outdoor recreation destination and has a large stock of seasonal and rental housing. It has an abundance of RV sites, campgrounds, and hotels and motels.

Furthermore, because of a severe contraction in manufacturing and timber industry employment that Coos County sustained in the past 25 years, there is an overhang of excess housing in the market. The County's population is less today than what it was 26 years ago. This unusual phenomenon of declining population has led to persistently high vacancy rates in housing, which means the area around the JCEP has ample housing capacity for most craft workers, construction managers, and staff.

Housing Forecast

The analysis reviewed the housing data for Coos County. The housing stock of the county is concentrated in the communities in close proximity to the JCEP project. Almost two-thirds of all the housing units in the County, according to the 2000 Census, were in the Coos Bay and North Bend Zip codes.

Housing forecasts were made using projections from Claritas, Inc., which is a nationally recognized leader in demographic forecasts, in combination with Coos County assessor, and F.W. Dodge construction data. The Claritas and Dodge forecasts were made for the year 2009, which would be the year of the highest potential impact.

The 2009 data in Table 6 is described as a "baseline forecast" because it describes what housing conditions would be like given expected economic events excluding JCEP construction.

Table 6: Coos County Housing Stock, Occupancy, and Vacancy Levels, 2000 Census and 2009 Baseline Forecast

Housing Characteristics	2000	2009
Housing Units by Occupancy:		
Occupied*	26,213	27,391
Vacant or vacant part-year:		
Seasonal use	843	1,024
Rented/sold, unoccupied	163	171
For rent, sale or other	2,028	1,658
Vacant subtotal	3,034	2,853
Total housing units	29,247	30,244
Housing Units by Type:		
Single family, built on-site	20,033	21,305
2, 3, or 4 family homes	1,774	1,887
Multi-family, 5 or more units	2,361	2,633
Mobile homes	4,706	4,096
RVs, boats, other housing	373	323
Total housing units	29,247	30,244
Vacancy Rates:*		
Single family, built on-site	9.4%	8.6%
2, 3, or 4 family homes	10.5%	9.6%
Multi-family, 5 or more units	15.9%	14.4%
Mobile homes	10.7%	9.8%
RVs, boats, other housing	20.4%	19.5%
All housing units	10.4%	9.4%

** The baseline forecast excludes the impact of LNG terminal construction employees*
Sources: Claritas, Inc. and ECONorthwest

Coos County has been experiencing increases in retiree households and non-resident, seasonal homeowners, but this is mostly backfilling losses in working-age families that have been leaving for communities with better employment opportunities. Thus, the resident population and school enrollments have been declining.

Between 2000 and 2005, the population of Coos County fell by 84 residents making it only one of six counties in Oregon to experience a population loss.[4] Many second and retirement homebuyers are building units more suitable to their needs and interests, leaving older, family housing empty, thus, fueling the persistently high vacancy rates in the County.

[4] According to the Portland State University Population Research Center at http://www.pdx.edu/prc/.

The forecast calls for 30,244 housing units in 2009 and 9.4 percent vacancies. There would be 2,853 vacant units in the established housing stock for construction workers. Of these homes, 1,658 would be non-seasonal vacancies available to workers.

It would appear that the existing housing stock alone in 2009 would be more than ample for the anticipated peak need of 532 non-local households and individuals. The workers would also have a large selection of motels, RV parks, and other forms of temporary lodging to choose from.

Hotel and Motel Capacity

Being a summer vacation destination, the area from Florence to Bandon on the Oregon coast—for which the JCEP is about at the midpoint—has an abundance of hotels and motels. Within 35 miles of the JCEP there are over 50 commercial lodging properties.

As shown on Table 7, in 2009 the commercial lodging properties would be able to supply 2,358 rooms a day. In addition to these, there are about 250 rooms available in small motels and bed & breakfast places. The total supply, not including vacation rental housing, is 2,608 rooms a day.

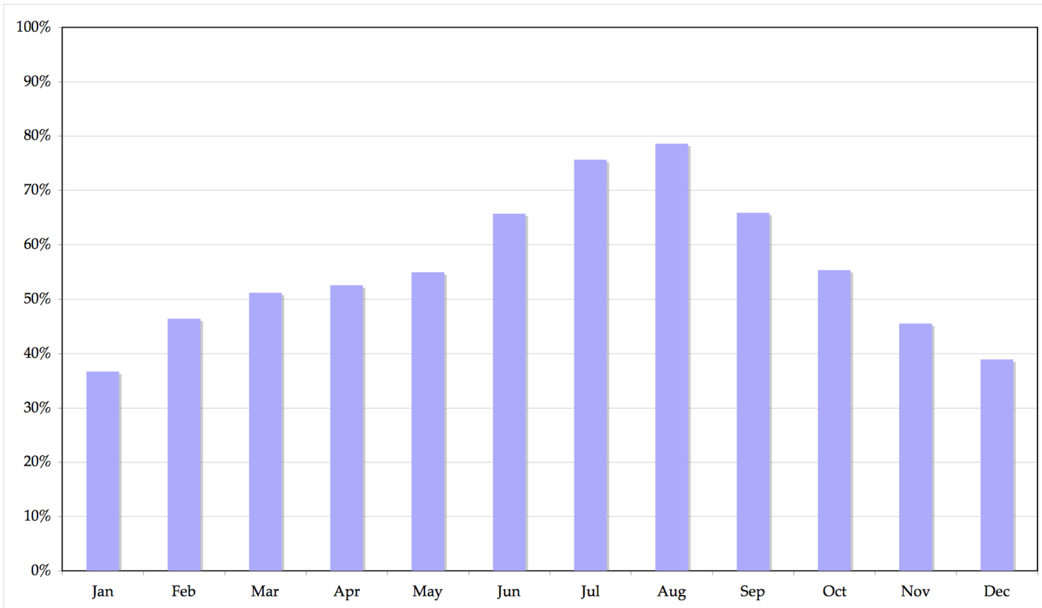
Table 7: Hotel and Motel Supply Near Proposed Terminal, 2009

Property	City	Rooms	Property	City	Rooms
Anchor Bay Inn	Reedsport	21	Lakeshore Lodge	Lakeside	20
Bandon Wayside Motel	Bandon	10	Lamplighter Motel	Bandon	16
Bandon Dunes	Bandon	144	Lighthouse Inn	Florence	26
Bay Bridge Motel	North Bend	16	Mill Casino Hotel	North Bend	200
Bayshore Motel	Coos Bay	34	Motel 6 Coos Bay	Coos Bay	94
Best Budget Inn	Reedsport	23	Myrtle Lane Motel	Coquille	25
Best Western Holiday Motel	Coos Bay	83	Myrtle Trees Motel	Myrtle Point	29
Best Western Inn @ Face Rock	Bandon	74	Old Town Inn	Florence	40
Best Western Pier Point Inn	Florence	55	Pacific Empire Motel	Charleston	50
Best Western Salbasgeon Inn	Reedsport	57	Park Motel	Florence	16
Caprice Motel	Bandon	15	Parkside Motel	North Bend	16
Captain Johns Motel	Charleston	44	Plainview Motel	Coos Bay	9
City Center Motel	North Bend	18	Red Lion Hotel Coos Bay	Coos Bay	143
Comfort Inn North Bend	North Bend	96	River House Motel	Florence	40
Driftwood Motel	Bandon	22	Sea Psalm Motel	Coos Bay	8
Driftwood Shores Resort	Florence	136	Shooting Star Motel	Bandon	15
Economy Inn	Florence	29	Silver Sands Motel	Florence	50
Economy Inn	Reedsport	41	Southside Motel	Coos Bay	11
Edgewater Inn	Coos Bay	82	Sunset Motel	Bandon	71
Fir Grove Motel	Reedsport	16	Table Rock Motel	Bandon	24
Gorman Motel	Bandon	28	Three Rivers Hotel	Florence	90
Harbor View Motel	Bandon	57	Timber Inn	Coos Bay	53
Holiday Inn Express	Florence	52	Villa West	Florence	22
La Chateau Motel	Florence	49	Winchester Bay Inn	Winchester Bay	51
La Kris Motel	Bandon	12	Windermere By The Sea	Bandon	25

Sources: ECONorthwest and Smith Travel Research

The average occupancy rate of the properties shown in Table 7 has averaged 57.7 percent in the last year. However, the pattern is very seasonal. Because of the cool dry summers and wet climate throughout much of the rest of the year, lodging demand on the Oregon coast is high in the summer, but suffers from protracted weakness in the shoulder and off-seasons. This is illustrated in Figure 4

Figure 4: Average Monthly Occupancy Rates in Commercial Lodging, Coos County Area, 5-Year Monthly Averages Through August 2006



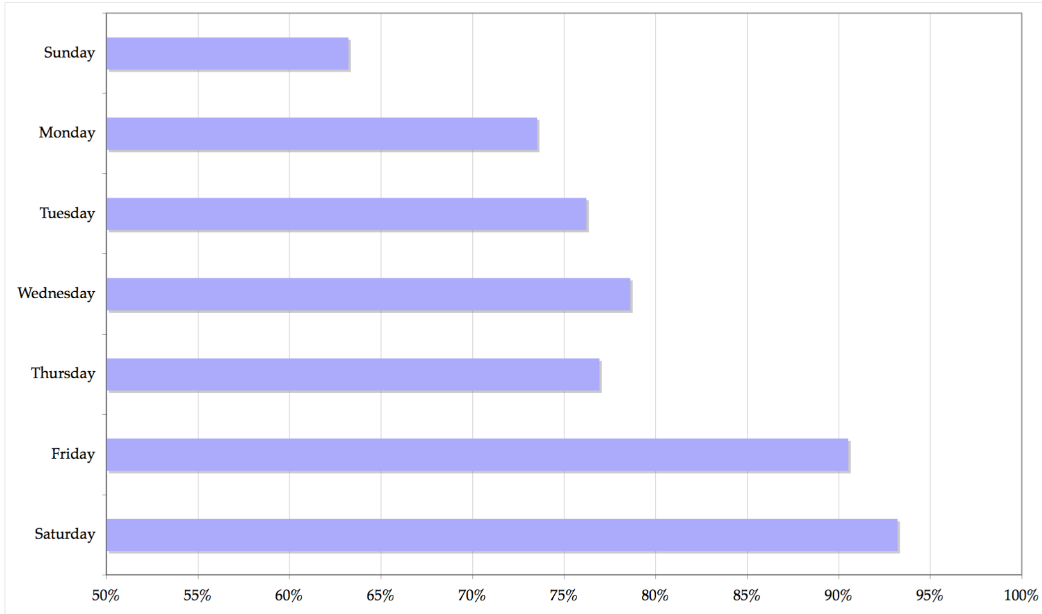
Source: Smith Travel Research and ECONorthwest.

January is the slowest month. Occupancy rates average only 36.7 percent, which implies 1,492 rooms are unsold every day—far more than what the construction workers would need. In the peak month of August, conditions are tight. August 2006, for example, occupancy averaged 79.4 percent, which means there were 494 unsold rooms a day—about a thousand fewer than in January.

There is also a strong weekly pattern, which works in favor of construction workers. The Oregon Coast is so close to major cities that it attracts many weekend travelers. In August 2006, average occupancy on Sunday nights, which is the slowest day of the week, was only 63.2 percent. There were an average of 868 unsold rooms on the average Sunday night.

The peak, as illustrated on Figure 5, occurs on is Saturday. The average Saturday occupancy this August was 93.2 percent, which implies that there were only 160 unsold lodging rooms available. However, other than Fridays and Saturdays, when many non-local construction workers would not need rooms, occupancy rates even in the peak month of August run well below 80 percent.

Figure 5: Average Daily Occupancy Rates in Commercial Lodging, Coos County Area, August 2006



Source: Smith Travel Research.

Overall, there is a large supply of commercial lodging within a 35-mile radius of the construction jobsite. Except for holidays, Spring Break week, and the summertime months of July and August, there is in excess of 800 unsold rooms a day in the market. Even during the peak month of August, there are in excess of 500 unsold rooms from Sunday through Thursday nights.

Thus, JCEP workers commuting to and from home on weekends would be able to secure accommodations even at such times. For those seeking continuous residence extended over the summer months, other accommodations would be more practical. For them, there is a supply of 1,658 housing units in Coos County that are not used seasonally, and many RV sites.

RV Park Capacity

Coos County has ample RV site capacity in places close to the JCEP construction project. The analysis shows that there would be at least 1,864 RV sites amounting to 666,059 days of supply in 2009. The locations and capacities of various RV parks in the County are listed on Table 8. In addition to these, there are well over a thousand near Florence, which is about a half hour drive from North Bend.

Table 8: Recreational Vehicle Site Supply in Coos County, 2009

Type, Name of RV Park & Season if Not Full Year	Place	Spaces	Supply in 2009
Private Parks:			
Robbins Nest RV Park	Bandon	50	18,300
Bandon Loop	Bandon	21	7,686
Bandon by the Sea	Bandon	43	15,738
Bandon RV Park	Bandon	46	16,836
Charleston Marina RV Park	Charleston	108	39,528
Oceanside RV Park	Charleston	70	25,620
Plainview RV Park	Charleston	46	16,836
Kelley's RV Park	Coos Bay	38	13,908
Alder Acres RV Park	Coos Bay	38	13,908
Midway RV Park	Coos Bay	45	16,470
Lucky Logger	Coos Bay	78	28,548
Arbe's RV Park	Coos Bay	15	5,490
North Lake Resort (8 Mo. Season)	Lakeside	110	26,840
Osprey Point RV Resort	Lakeside	132	48,312
Oregon Dunes KOA	North Bend	63	23,058
The Firs RV Park	North Bend	88	32,208
The Mill Casino	North Bend	102	37,332
Publicly Owned Parks:			
Bullards Beach State Park	Bandon	185	67,710
Umpqua Lighthouse State Park	Coos Bay	20	7,320
William M. Tugman State Park	Coos Bay	102	37,332
Sunset Bay Sate Park	Coos Bay	63	23,058
Bastendorff Beach County Park	Coquille	56	20,496
La Verne	Coquille	46	16,836
West La Verne	Coquille	22	8,052
Sixes River	North Bend	19	6,954
Powers County Park	Powers	70	25,620
Eel Creek	Reedsport	52	19,032
Spinreel	Reedsport	36	13,176
Wild mare Horse Camp	Reedsport	12	4,392
Bluebill (7 Mo. Season)	Reedsport	18	3,843
Horsfall	Reedsport	70	25,620
Total Public and Private		1,864	666,059

Source: ECONorthwest

As with hotels, RV space demand is highly seasonal and greatest on the weekends. Therefore, non-local construction personnel commuting in for weekday stays generally would find space available. Currently, nearly 65 percent all RV sites have full hookups and the annual average occupancy rate for RV parks in the County is about 47 percent. During the inclement winter months, occupancy rates fall below 30 percent.

Manufactured Home Parks

Oregon law prohibits communities from zoning out manufactured (mobile) housing. They can be found in any community, although they are more prevalent in rural areas, such as Coos County, because in such places it is often uneconomic to construct stick-built, moderately priced housing.

About 70 percent of manufactured homes in the Coos County are located in general communities or as standalone properties. The other 30 percent are in managed manufactured home parks that are set up for permanent and also temporary residents who move in mobile homes, and sometimes RVs, onto established sites.

The most recent inventory by the State of Oregon found 51 manufactured housing parks inside Coos County. Those parks had 1,405 spaces. Although it is unclear how many spaces are currently unoccupied, data from the tax assessor shows a decline of 680 property tax accounts for improved manufactured housing structures in the County in the past six years. The implication is that many homes have been moved and that there is ample site capacity available for construction workers seeking a temporary residence near the JCEP jobsite.

Table 9: Coos County Manufactured Dwelling Parks, 2006

Name	Location	Spaces	Name	Location	Spaces
Alder Acres	Coos Bay	48	Little Valley	Coquille	27
Aseere	Coos Bay	7	M'Ocean	Coos Bay	39
Bay Ridge	Myrtle Point	37	Mount Terrace	Coos Bay	23
Bayway	Coos Bay	40	North Bayshore	North Bend	58
Beach Loop Junction	Bandon	15	North Lake Resort	Lakeside	12
Blue Spruce	Lakeside	22	Pine Cove	Coos Bay	9
Brite Forest	Myrtle Point	44	Pine Mobile Court	Coos Bay	7
Bunker Hill	Coos Bay	14	Plainview	Coos Bay	24
Cedar Point	Coquille	15	Powers Valley	Powers	25
Chard's Mobile Home Court	Coos Bay	6	Puerto Vista	Coos Bay	146
Charleston Trailer Park	Coos Bay	8	Remote Outpost	Myrtle Point	6
Coos Bay Heights	Coos Bay	40	Saint's Mobile Home Park	Coos Bay	30
Country Living	Bandon	25	Sandbar	North Bend	16
Driftwood	Coos Bay	9	Sand-N-Wood	North Bend	30
Dunes Mobile Ranch	North Bend	66	Shady Lane	North Bend	6
East Bay Drive	North Bend	6	Shorb's	Powers	16
Firs Trailer Park	North Bend	24	Shorepines	Coos Bay	236
Flora Grove	Myrtle Point	7	Sleepy Hollow	Myrtle Point	7
Gateway	Coos Bay	17	Springtide	Coos Bay	18
Haga's Mobile Park	Bandon	12	Tower's Bay Crest Estates	Coos Bay	14
Hilltop	Bandon	19	Valley View Mobile Court I	Coquille	43
Huckleberry Hill	Coos Bay	28	Valley View Mobile Court II	Coquille	16
Jacobson's	Coos Bay	6	Vista Verde Estates	Coquille	7
La Playa	Lakeside	6	Wildwood Estates	North Bend	45
Libby Meadows	Coos Bay	6	Wildwood Trailer Park	North Bend	12
Lil Acres	Myrtle Point	6	Total		1,405

Source: Oregon Housing and Community Services, October 2006.

Conclusion on Housing and Other Lodging

An analysis of the stock of housing, hotel and motel rooms, RV park sites, and manufacture dwelling parks indicates that the market could comfortably accommodate the anticipated influx of non-local JCEP construction personnel.

At its peak, June 2009, the JCEP would stimulate demand for 53 housing units for families, and for a mix of housing units and group-quarters establishments by 479 others. The forecast indicates that there would be 1,658 housing units, about 574 lodging units, and numerous RV park spaces available in that peak month. Although the supply of RV sites and lodging units would be tighter on weekends, labor supply data strongly suggest that many of the JCEP workers would come from the Eugene and Portland labor markets. By commuting home on weekends they would free-up places for the Friday and Saturday overnight stays by tourists.

JCEP construction personnel would have a beneficial economic impact on the owners of lodging, RV and mobile home parks, and vacation housing properties in Coos County by filling rooms in the otherwise slow shoulder and off season months.

Schools

The JCEP terminal would lie entirely within the boundaries of North Bend School District. Its schools could be affected in two ways by the construction project. First, the project could help fund the local school district. Second, the project would have an impact on enrollment.

Direct Fiscal Impact

When completed, the JCEP terminal would greatly increase the property tax base of Coos County and various local taxing districts.

One such district is the North Bend Urban Renewal Agency, first initiated in October 1986 with the intent to eliminate blighted areas and stimulate industry by providing tax money for improvements. The site of the proposed terminal lies completely within the boundaries of the Agency.

Under normal circumstances, the amount of money designated for schools equals 44 percent of every property tax dollar collected after exemptions and rate limits have been accounted for. However, almost all of the $8 million in estimated annual property taxes that would be paid by the finished JCEP terminal would be placed in the Urban Renewal fund.

When the Urban Renewal district was first initiated, the assessed value of the proposed terminal site was $36.9 million. This is known as the "frozen value;" only property tax collected on assessed value above this point is placed in the Urban Renewal fund. Since that time, the Weyerhaeuser paper mill that had been operating on the site closed, causing the assessed value to decrease to $14 million. When the JCEP project is completed, the assessed value of the site will rise past the "frozen value." The difference in the past and current assessed values—$22 million—will be taxed as if the Urban Renewal district did not exist.[5]

Of this $22 million, the normal property tax rate will be levied, of which 44 percent would be designated for schools. Much of that benefit, however, would be shared with other districts around Oregon.

In an effort to treat all students in Oregon fairly, property taxes for schools are aggregated by the State and distributed to all of the districts in Oregon based on an equalization formula tied primarily to enrollments. Therefore, the direct fiscal benefit to the North Bend School District from property taxes paid by the JCEP would be diluted by equalization.

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[5] Phone interview with Barbara Foord, Chief Deputy Assessor of Coos County, October 30, 2006.

The amount of excess money that reaches the North Bend School District due to increased property taxes will be quite small. The North Bend City Code provides no dispensation for school funding within the Urban Renewal district when the assessed value of a development is higher than the "frozen value"; the schools would receive no benefits from an increased property tax base due to the JCEP development.[6]

Since the JCEP development will be built in an area that has long had an Urban Renewal designation, it will not have a harmful effect on school funding. The net effect of the development on funding could be positive in the future when the Urban Renewal designation is lifted.

Whether or not the Urban Renewal district is in effect, the North Bend School District is likely to benefit from the JCEP indirectly in two ways.

First, the addition of the JCEP to the tax base is going to reduce the tax rates of homeowners in North Bend for their school bond levy. This, according to the District Superintendent, would enhance the likelihood that voters would pass needed future bond measures for the schools.[7] It would also make a local option property tax more plausible.

Second, the analysis estimates that the JCEP, once in operation, is going to directly and indirectly provide wages for almost 400 households in Coos County and over 40 percent of them are apt to live in the North Bend District. This would cause a rise in enrollments.

For every new student, roughly $5,500 a year in extra funding would be handed down from the State to the North Bend School District. While these new students would necessitate higher operational spending, they would have a minimal impact of capital budgets because the schools are presently running well below capacity. Thus, nearly all of the incremental State dollars would go to classroom instruction.

According to the District Superintendent, the influx should not be a problem; enrollment has been trending down and two schools have been consolidated but space remains. Furthermore, the District projects that high school enrollment will decrease in three years, at roughly the same time construction of JCEP would be complete. In the 1999-2000 school year the North Bend School District had 2,682 students. In 2004-2005, there were 2,319—a 14 percent drop in just five years.

[6] North Bend Municipal Code, Chapter 2.52.

[7] Phone interview with B.J. Hollensteiner, North Bend School District #13 Superintendent, October 31, 2006.

During construction and in its first three operating years, the JCEP may have an enterprise zone exemption, which would relieve it from paying property taxes. However, the JCEP has agreed to contribute in lieu of taxes an amount equal to what the County, School District, and other districts had received when the Weyerhaeuser paper mill had been operating on the North Spit site, which the JCEP would occupy. It is believed that the share of this donation that would go directly to the North Bend School District would not be subject to the State equalization formula nor would it be affected by the urban renewal district designation.

The Coos Bay School District is outside of the North Spit. It would receive additional State revenues in proportion to the projected increase in enrollment during the construction of the JCEP, which is detailed in the following analysis. Coos Bay schools, like those in North Bend, have experienced declining enrollments.

In the last five years, according to the Oregon Department of Education, the number of students in the Coos Bay School District has fallen nine percent. Likewise, the District probably has the physical capacity and operational funding increases from the State to accommodate the small increase in students expected because of the JCEP construction employment.

Enrollment Analysis

As noted on Table 5, although most construction workers would arrive as singles and not move their families, it is expected that 64 families would, at least temporarily, relocate to Coos County at some point during the 36-month construction period. At the peak month, there would be 53 family households, but on average there would be just 24. Most of these households would have school age children.

Residency and Commutation Behavior

To measure the impact of these family households on the school districts of Coos County, it is necessary to first estimate where in the County they would take-up residency. This was accomplished by weighing the following two factors:

(1) The distribution of where workers in Coos County live.

(2) What their commutation behaviors are like.

Data for this analysis came from the 2000 Census, which is the most recent source available on a geographic level fine enough to allow for school district estimates. The analysis is restricted to workers employed outside of the home, as this would be the characteristic of those working at the JCEP.

The Census data used appear on Table 10. It shows that 50 percent of workers traveled less than 15 minutes to their jobs and 69 percent lived in either the Coos Bay or North Bend Zip codes.

Table 10: Coos County Residents Employed Outside of Their Homes, Commutation Times and Home Zip Codes, and Forecast Distribution by School District of Where JCEP Family Households Would Live

Persons Employed Outside of Home	Number	% of Total
Commutation time:		
Less than 10 minutes	7,058	29.8%
10 to 14 minutes	4,651	19.6%
15 to 19 minutes	4,103	17.3%
20 to 24 minutes	2,257	9.5%
25 to 29 minutes	811	3.4%
30 to 34 minutes	2,086	8.8%
35 to 44 minutes	717	3.0%
45 to 59 minutes	824	3.5%
60 to 89 minutes	515	2.2%
90 or more minutes	699	2.9%
Worker home Zip code:		
97411 Bandon	2,296	9.7%
97414 Broadbent	39	0.2%
97420 Coos Bay	10,533	44.5%
97423 Coquille	2,469	10.4%
97449 Lakeside	465	2.0%
97458 Myrtle Point	1,741	7.3%
97459 North Bend	5,956	25.1%
97466 Powers	192	0.8%
Where JCEP workers would live:		
Bandon SD 54		1.9%
Coos Bay SD 9		49.2%
Coquille SD 8		1.8%
Myrtle Point SD 41		1.4%
North Bend SD 13		45.5%
Powers SD 31		0.2%

Sources: 2000 Census and ECONorthwest analysis.

Because of the proximity and size of the cities, JCEP construction employees would be far more likely to live in North Bend and Coos Bay than in other parts of Coos County. The jobsite would be closest to these two cities. Drive time estimates using Map Quest indicate that the average commute to the jobsite from homes in North Bend would be less than ten minutes and from Coos Bay, less than 15 minutes. Other communities are much further away. In addition, 65 percent of all the housing in the County is in North Bend and Coos Bay.

For these reasons, the analysis finds that nearly 95 percent of the family households of JCEP construction workers would reside in either the North Bend or Coos Bay school districts.

Characteristics of Family Households

Also needed for this analysis are the household demographics of those that would move their families to Coos County. For this, the 2006 Current Population Survey of Oregon and the 2000 Census were used.

The average Oregon household has 0.62 related children under the age of 18. This statistic, however, is irrelevant to this analysis because many households in the State, and in Coos County in particular, are either non-family households or the homes of retirees that generally do not have school age children living with them.

What is important is the number of school children living in the typical home where the head of the household has a full time job. This would be characteristic, by definition, of the households of the JCEP construction employees that would move to the area.

To estimate the number of children, a special table of the 2006 Current Population Survey was run for this analysis on statewide Oregon data. From this, it was determined that the average non-single household headed by a person with a full-time job had 1.202 children. Furthermore, by applying the 2000 Census data for Coos Bay, the analysis concludes that such households have an average of 0.915 children enrolled in public schools. This is shown in Table 11.

Table 11: School Enrollment of Children in Non-Single Households Headed by Full-Time Workers in Oregon, 2006

Household Data	Number
Oregon:	
All households	1,433,000
Related children* per household	0.62
Single person households	504,000
Related children per household	-
Households with 2 or more people:	
Total non-single households in Oregon	929,000
Related children per household	0.95
Those with a full-time worker	521,000
Related children per household	1.155
Unrelated children	0.046
Total children per working household	1.202
Coos County:	
Children per working, non-single household:	
School enrollment:	
Enrolled in K-12 public school	0.915
Enrolled in K-12 private school	0.033
Enrolled in Preschool	0.073
Home schooled (est.)	0.045
Not in school	0.137
Total children per working household	1.202

** Children under 18 years of age.*
Sources: ECONorthwest analysis of data from the U.S. Census Bureau, "Current Population Survey Annual Social and Economic Supplement, 2006."

Impact of JCEP Construction Worker Families

Tying the location of worker families (Table 10) with the estimate of the average number of students enrolled in public schools per household (Table 11) yields a forecast of how many children of JCEP construction employees, that move their families into Coos County, would enroll in the various public school districts in Coos County. This is shown on Table 12.

Table 12: Forecast of Where JCEP Construction Worker Families Would Live in Coos County and Their Impact on Public School Enrollments

School District	Enrollment 2004-05 School Year	Average Month		Peak Month	
		JCEP Families	Public School Enrollment	JCEP Families	Public School Enrollment
Bandon SD 54	807	-	-	1	1
Coos Bay SD 9	3,681	13	12	26	24
Coquille SD 8	1,026	-	-	1	1
Myrtle Point SD 41	740	-	-	1	1
North Bend SD 13	2,319	11	10	24	22
Powers SD 31	147	-	-	-	-
Total	8,720	24	22	53	49

Sources: Oregon Department of Education and ECONorthwest.

In the average month during the 36-month construction phase, the analysis estimates that there would be 24 family households living in the County and that they would be almost evenly distributed between the Coos Bay and North Bend school districts. In total, these households would add 22 students to the public schools, which is less then one-half of one-percent of the last published enrollment figures for the districts reported by the Oregon Department of Education.

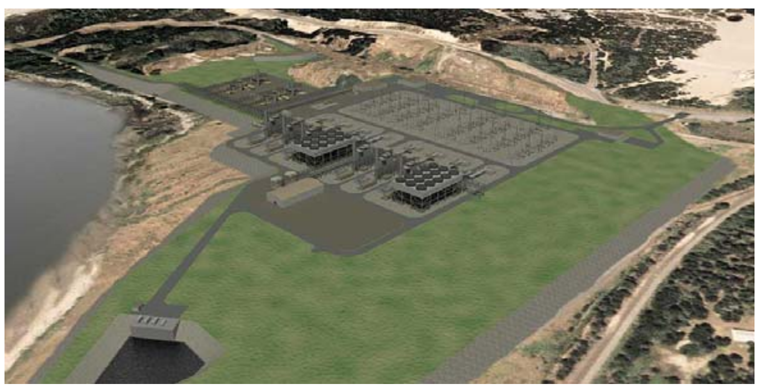
Even when considering the peak month, there would only be 53 additional family households and 49 more public school students spread over five of the County's six school districts.

In conclusion, the impact of the construction workers on enrollments at the public schools would appear to be very modest.

APPENDIX U-6

Jordan Cove Project L.P., Thermal Plume Study

Jordan Cove Energy Project, L.P.
Thermal Plume Study



Prepared for:

Jordan Cove Energy Project, L.P.

Prepared by:

TRC Environmental Corporation
Lyndhurst, NJ

July 2013

1.0 THERMAL PLUME STUDY

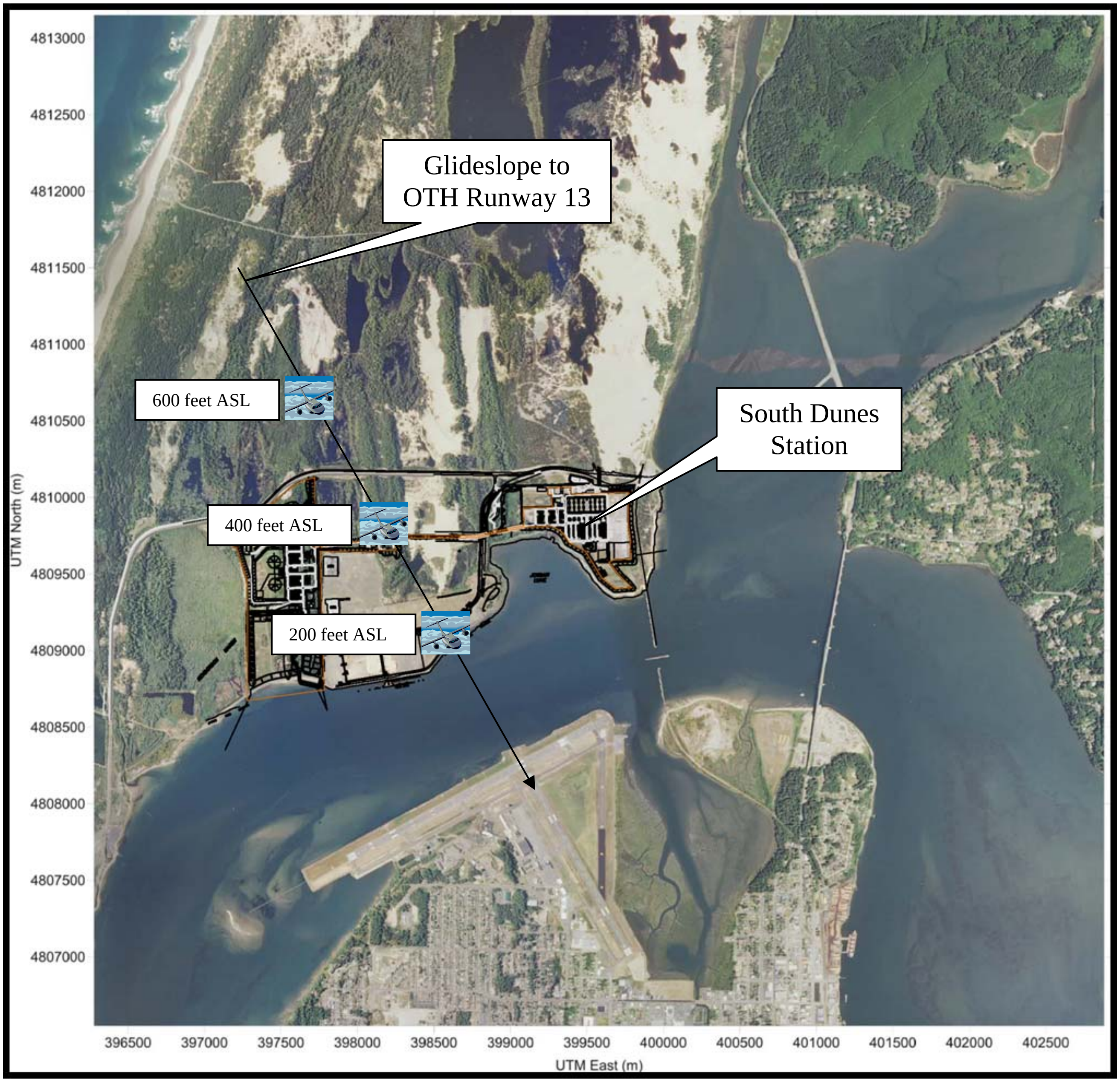
1.1 Introduction

Jordan Cove Energy Project, L.P. is proposing to construct and operate a liquefied natural gas (LNG) export terminal on an approximate 168-acre site located on the bay side of the North Spit of Coos Bay, Oregon between Coos Bay Navigation Channel Miles (CM) 7.0 and 8.0. The project, known as the Jordan Cove Energy Project (JCEP) LNG Terminal Project, or Project (or Facility) will consist of facilities to receive, liquefy, temporarily store, and send out up to approximately six million metric tons per annum (MMTPA) of LNG. The LNG terminal will be capable of loading LNG ships ranging in capacity from 89,000 cubic meters (m^3) to 160,000 m^3. The LNG loaded onto the ships will be transferred by cryogenic service piping from two 160,000 m^3 (1,006,000 barrels) full-containment LNG storage tanks where it will be stored in a liquefied state until it is pumped out to the LNG vessels. The following liquefaction facilities are proposed for the Project:

- Four liquefaction trains, each with the capacity of 1.5 MMTPA;
- Two feed gas cleaning and dehydration trains with a combined natural gas throughput of approximately 1 billion SCF/day (Bscf/d);
- Refrigerant storage and resupply system;
- Aerial Cooling System (Fin-Fan) to reject heat removed during the LNG liquefaction process; and
- The South Dunes Power Plant, a nominal 420 megawatt (MW) natural gas fired combined-cycle electric power plant for the purpose of powering the natural gas liquefaction process systems.

The proposed Project will utilize five GE LM6000 PG combustion turbines, each with an exhaust stack 119 feet above grade (or 167 feet above sea level (ASL)), used primarily for powering the natural gas liquefaction process systems. The proposed Facility will be located at approximately 43.434024 North Latitude, 124.243219 West Longitude, North American Datum 1983 (NAD83). The approximate Universal Transverse Mercator (UTM) coordinates of the proposed facility are 399,383 meters Easting, 4,809,765 meters Northing, in Zone 10, NAD83. The project site is proximate to the normal air traffic patterns of North Bend Municipal Airport (currently known as the Southwest Oregon Regional Airport or OTH), which is approximately located 1.6 km to the South of the proposed South Dunes Power Station. Figure 1-1 shows the location of the South Dunes Station along with the glide slope to runway 13 of the Southwest Oregon Regional Airport.

Figure 1-1: Site Location Map with glideslope to OTH



An analysis of the potential for the South Dunes Power Station and Gas Conditioning system exhaust plumes to impact flight operations directly over the proposed Project was made in accordance with a request from Jordan Cove Energy Project, L.P.

1.2 Vertical plume velocity guidelines

The Federal Aviation Administration (FAA) has identified thermal plumes as being a potential flight hazard where pilots should avoid flight in the vicinity of those plumes (Section 7-5-15 of the Aeronautical Information Manual: Official Guide to Basic Flight Information and ATC Procedures, February 2012). The FAA has issued guidance for pilots to fly upwind of possible thermal plumes in order to avoid the potential for the high temperature thermal exhausts to cause air turbulence around the aircraft. The FAA currently does not have any guidelines for conducting thermal plume assessments but is currently conducting studies to further characterize the effects of thermal plumes. Until those FAA studies are completed, pilots are encouraged to exercise caution when flying in the vicinity of thermal plumes.

Since the development of a simple-cycle gas turbine power station at the end of a runway in Australia in the mid-1990s, the Australian Civil Aviation Safety Authority (CASA) has taken an active role in the review of the siting of facilities with the potential to affect aviation activities. Potential hazards that could affect the safety of aircraft include tall visible or invisible obstructions. Invisible obstructions include industrial exhausts that generate significant turbulence due to high velocity and buoyancy. CASA has issued an Advisory Circular, (CASA-AC-139-5, 2012) that specifies the requirements and methodologies to be used to assess whether a new industrial plume is likely to have adverse implications for aviation safety. The CASA guidance includes a range of critical plume velocity (i.e., the velocity at which the vertical plume rise may affect the handling characteristics of aircraft in flight such that there may be a momentary loss of control) of between 4.3 and 10.6 meters per second (m/s). The selection of critical plume velocity is based upon a range of considerations including the phase of flight affected, the size of aircraft, the frequency of use of flight path, presence of air traffic control, and human factors. It should be noted that a vertical velocity of 4.3 m/s is associated with typical towering cumulous clouds while cumulonimbus clouds (i.e., thunderstorms) typically have vertical velocities in the 10-25 m/s range.

The aim of this assessment is to determine the potential for the plumes emitted from the Project to exceed the minimum critical plume velocity of 4.3 meters per second (m/s) within the flight path to the Southwest Oregon Regional Airport.

1.3 Stack Exhaust Characteristics

The assessment focused on the Project components most likely to generate a plume vertical velocity that could exceed the critical plume velocity. Therefore, the assessment focused on those Project components with the most substantial momentum flux at stack exit and buoyancy flux at stack exit, which is a function of exhaust flow and temperature. The facility equipment, that would generate the greatest plume vertical velocity are the five GE LM6000 combustion turbines due to their large volumetric flows and proximity to one another. Thus, this study focused on determining a maximum calculated vertical velocity due to the combustion turbine exhaust plumes.

The Project also utilizes thermal oxidizers as part of the gas conditioning systems and air cooled condensers as part of the combined cycle power plant operations. The total combined volumetric flow rate from the two thermal oxidizers is 4% of the total flow from the five combustion turbines. Thus, it is expected that the plume vertical velocity generated from the thermal oxidizers will be substantially lower in magnitude than the plume vertical velocity from the combustion turbine stacks. Similarly, the two air cooled condensers are expected to have a minimal contribution to a plume vertical velocity outside of an immediate area above the units. This is due to the low exit velocity for each fan (typically below 3-5 m/s) and due to the minimal temperature differences between the fan exhausts and the ambient temperature. For these reasons, it is expected that the buoyancy flux and momentum fluxes would be minimal outside of the direct area above the units (i.e., within a few hundred feet above the fan deck).

The stack exhaust characteristics for each of the five combustion turbines are shown in the following Table 1:

Table 1: Combustion Turbine Exhaust Characteristics

Stack Exhaust Parameters	GE LM6000 Combustion Turbines	
	English	**Metric**
Height	119 feet	36.27 meters
Flowrate	355,123 ACFM	167.6 m^3/s
Velocity	75.36 ft/sec	22.97 m/s
Temperature	251.8 F	395.3 Kelvin
Diameter	10.0 feet	3.05 meters

1.4 Modeling Methodology

This assessment was based upon both a conservative theoretical approach, which determines the potential for turbulence generated by the plume-averaged vertical velocity of Project's exhaust plumes as well as a conservative modeling approach using the Project design and local meteorological conditions. Additional approaches using typical meteorological conditions were also developed to provide representative plume vertical velocities.

Theoretical Approach

This method uses worst-case assumptions of calm winds and neutral atmospheric conditions for the entire vertical extent of the plume to determine the worst-case impacts. It should be noted that this methodology determines the maximum potential vertical velocity in the direct airspace above the South Dunes Station combustion turbine exhaust stacks but does not determine the vertical velocities as a function of horizontal distance from the stacks. This theoretical approach is presented to define the critical plume height at which, the vertical velocity exceeds the threshold of 4.3 m/s.

The methodology followed in this assessment is outlined in the Aviation Safety and Buoyant Plumes paper presented at the Clean Air Conference in South Wales, Australia, by Peter Best et al. This paper is included in Appendix A. The methodology presented and used in the assessment has been based upon well-verified laboratory and theoretical treatments of the rise and spread of a buoyant plume. The plume growth involves several stages of development detailed below:

Stage 1: In the first stage near to the stack exit, the high plume momentum results in a short distance in which the conditions at the center of each plume are unaffected by ambient conditions. The potential plume core in which maximum vertical velocity and temperature remain constant extends to a distance of approximately 6.25 * D (where D is stack exit diameter) in calm wind conditions. At the end of this stage, the plume average vertical velocity is approximately half of the stack exit velocity.

Stage 2: The plume dynamics and trajectories in this stage respond to ambient air, with much cooler air being entrained into the outer regions of the plume. The momentum and buoyancy of the plume significantly influence the plume rise as this air mixes into the plume and provides dilution to decrease plume vertical velocities. This dilution is sensitive to ambient wind speeds and thus, the use of calm wind conditions is considered to be conservative.

Stage3: At this time the plume rise is due entirely to the buoyancy of the plume and continues until such time that there is an equalization of turbulence conditions within and outside of the plume. This final rise occurs at considerable distances and heights from the stack exit and where the effective vertical velocity would be close to zero. This stage is not assessed quantitatively as near-zero vertical velocities are associated with minor to negligible turbulence.

In addition to the theoretical approach for calculating potential plume vertical velocities based upon calm wind conditions, an alternative methodology was utilized for calculating expected vertical velocities based upon more typical meteorological conditions at the site. This approach utilized more typical horizontal wind conditions expected at the site (based upon the 20th

percentile recorded wind speed at OTH of 2 m/s) rather than the worst-case assumption of calm winds throughout the plume. The methodology followed for the typical meteorological conditions assessment is outlined in the paper: Potential for Power Plant Stack Exhaust to Disrupt Aircraft Operations (Joel Reisman and David LeCureux). The methodology presented and used in the assessment has been based upon well-verified laboratory and theoretical treatments of plume rise that is utilized by U.S. EPA in most of their dispersion models.

Modeling Approach

Using the combustion turbine exhaust parameters presented in Table 1, modeling was performed using the AERMOD computer dispersion model to assess the minimum plume dilutions within vertical planes in the regional area around the South Dunes Station. The modeled plume dilutions were then used to develop volumetric averaged plume temperatures resulting in theoretical maximum vertical velocities in both the horizontal and vertical planes around the South Dunes Station. In addition to the using the minimum modeled plume dilutions (i.e., the maximum modeled concentrations) an additional case was developed utilizing more typical, albeit infrequent, meteorological conditions based upon the 98^{th} percentile maximum modeled concentrations. By using this methodology, a vertical velocity was calculated based upon meteorological conditions that would be expected to occur only 175 hours in a year.

The AERMOD model is a state-of-the-art steady-state Gaussian plume model that can be used to assess concentrations from a wide variety of sources associated with an industrial source complex. The model includes the PRIME (Plume RIse Model Enhancements) algorithm for improved treatment of building downwash and cavity area effects. Specifically, the AERMOD model with PRIME features enhanced plume dispersion coefficients due to the wake turbulence and reduced plume rise caused by descending streamlines and increased entrainment in the wake of a structure. One of the important aspects of the PRIME algorithm is its ability to model the downwind turbulent cavity (i.e., near wake) and far wake areas on a three dimensional scale. Thus, the AERMOD model is preferred for modeling the South Dunes Station combustion turbines given the large number of building tiers and structures on the site that create a variety of turbulent cavity regions. The AERMOD model is applicable for assessing the air quality concentrations for locations at industrial sources where aerodynamic downwash is important, in rural or urban areas, in flat or rolling terrain, and for point elevation above ground level.

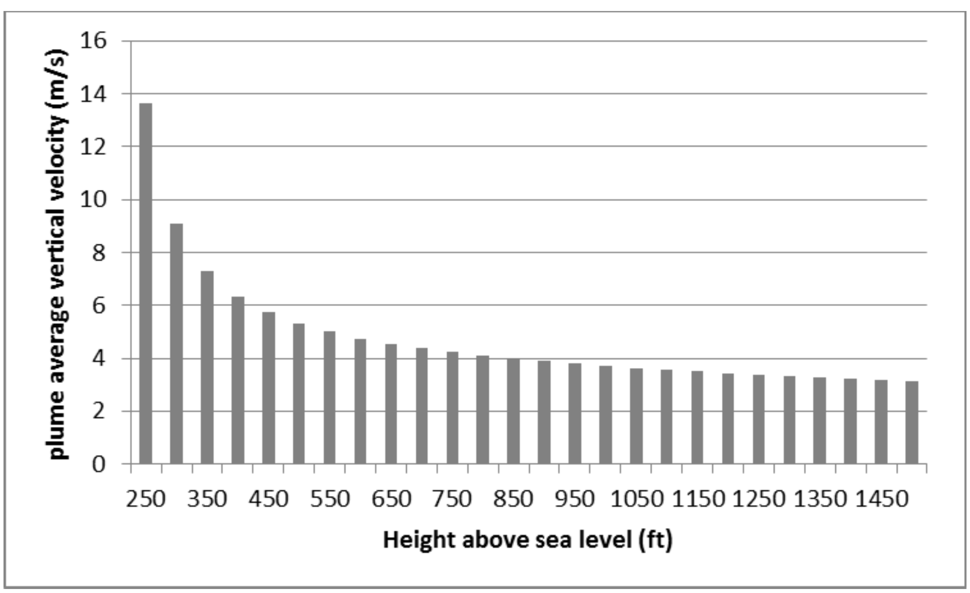
The thermal plume analysis utilized five years of meteorological data collected from 2007-2011 from the meteorological tower at the Southwest Oregon Regional Airport. The assessment focused on a 10 km x 5 km area starting at the landing point of Runway 13 at the airport. Vertical planes were developed for 100 feet vertical increments at levels from 100 feet to 1,000 feet ASL (i.e., the heights at which the maximum vertical velocities may be expected to occur from this Project).

The modeled plume dilutions across the 5 years of meteorological data and over the 50 square kilometer horizontal planes at ten heights were then utilized to develop volumetrically averaged plume temperatures. The difference in plume temperature and ambient temperature would lead to the acceleration of an air parcel due to the density differences at a given level. A conservative method to calculate plume vertical velocity was developed using the meteorological concept of convective available potential energy (i.e., CAPE or potential buoyancy) that is typically used to calculate the maximum theoretical vertical velocity of thunderstorms.

Using the modeled plume temperatures, a convectively driven vertical velocity is calculated at each modeled level by integrating (i.e., summing) the calculated layer CAPE at each 100 ft vertical increment above sea level. This methodology assumes that positive buoyancy will occur at each modeled level such that the vertical velocity will keep increasing until it reaches the equilibrium level (i.e., the level at which the plume temperature equals the ambient temperature). This methodology results in a conservative estimate of vertical velocity in a column of air since it is based upon layering maximum modeled plume temperatures regardless of the time and space that they would occur.

1.5 Modeling Results

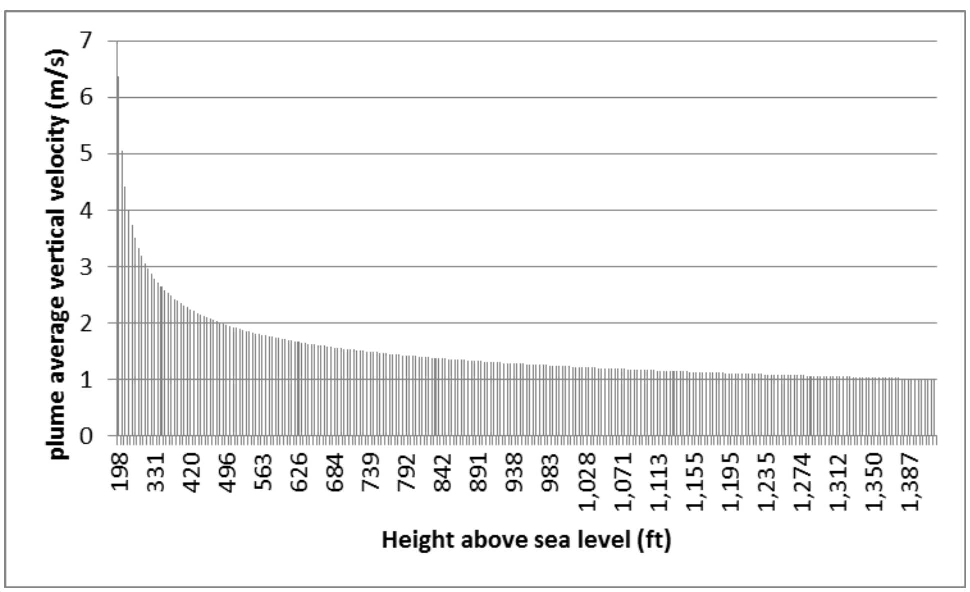
Using the methodologies described in Section 1.4, the maximum theoretical plume vertical velocity was calculated for the area directly above the South Dunes Station exhaust stacks. The results are detailed in Appendix B and summarized in the following chart at various heights above sea level.



As shown in the chart, the vertical velocity exceeds the threshold of 4.3 m/s up to a height of 750 feet above sea level. The values presented in the chart above are very conservative estimates of the plume average vertical velocity as they assume the wind profile is constant with height and with no wind shear but in reality, there is considerable variation with height in light winds and even light horizontal winds would substantially reduce the predicted vertical velocities. Also, these vertical velocities are for the area directly above the South Dunes Station exhaust stacks. For example, even at a height of 1,500 above sea level the plume radius would be on the order of 200 feet from the stack centerline.

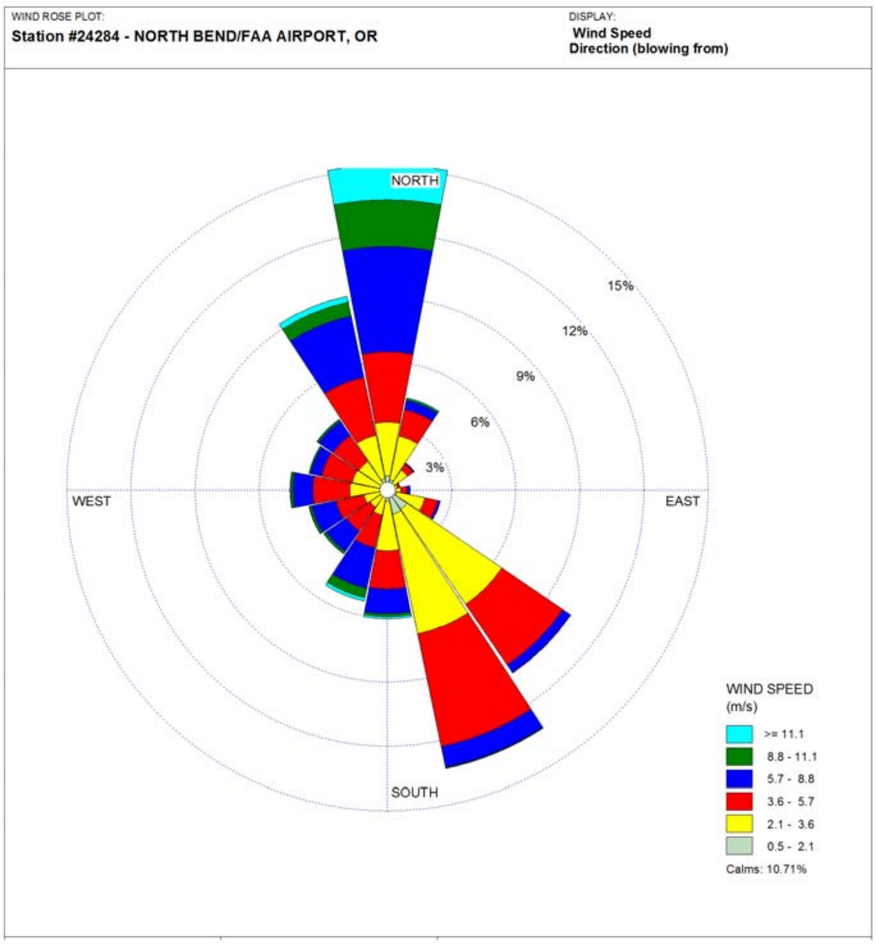
As shown in Figure 1-2 the frequency of calm winds in Coos Bay is approximately 10% of the year on an annual basis. The majority of winds occur from the North/Northwest and from the South/Southeast such that the plumes from the South Dunes Station would infrequently travel within the glide path to OTH. Additionally, winds from the East that would serve to push a plume into the glideslope to OTH Runway 13 occur infrequently (5% of the year) and at speeds greater than 2 m/s.

The results of the theoretical modeling assuming a minimal horizontal wind shear (i.e., a wind speed of 2.0 m/s) indicates that the vertical velocity exceeds the CASA threshold up to a height of 70 feet above stack top or 234 feet above sea level. A wind speed of 2.0 m/s or less would be expected to occur up to 20% of the year at the site. These results are summarized in the following chart.



The results of the modeling using five years of meteorological data with the AERMOD dispersion model are presented graphically at three flight levels (i.e., 200 feet, 400 feet, and 600 feet) in Appendix C with the units of meters per second. As shown in the graphics and as expected, there is a substantial vertical velocity gradient over the South Dunes Station, which confirms the results of the theoretical modeling presented earlier in regards to magnitude and horizontal extent of the plume. By using the 98th percentile modeled concentration results (representing the dispersion resulting in worst case plume vertical velocities for 175 hours per year) the results show that the CASA threshold is exceeded in the general direct airspace above the South Dunes Power Plant and quickly dissipates to less than 1.0 m/s in the direct flight path to the airport.

Figure 1-2: Southwest Oregon Regional Airport Windrose



1.6 Summary of Results

An assessment of the plume-average vertical velocity associated with the operation of the South Dunes Station combustion turbines was conducted using both conservative theoretical and modeled methodologies and for both worst-case and typical meteorological assumptions. The results of the theoretical assessment indicate that there is a potential for the CASA vertical velocity threshold to be exceeded up to a height of approximately 750 feet above sea level over the South Dunes Station exhaust stacks (at this height the plume diameter is approximately 180 feet under calm wind conditions). However, even by assuming a more realistic amount of horizontal wind shear, the calculated extent of exceedances of the CASA threshold extends to approximately 230 feet above sea level.

The results of the modeled assessment also indicate that the CASA vertical velocity threshold may be exceeded within the airspace above the South Dunes Station. It is expected based upon both the theoretical and modeled assessments that the CASA threshold would not be exceeded in the flight path to the airport under more typical, albeit still infrequent, wind conditions from those used in the worst-case assessment. Under these more typical meteorological conditions the CASA threshold would not be expected to be exceeded other than in the area directly above the South Dunes Power Plants exhausts.

The results of the assessment confirm the FAA guidance for pilots to fly upwind of possible thermal plumes in order to avoid the potential for the high temperature thermal exhausts to cause air turbulence around the aircraft. Specifically, in the airspace directly above the South Dunes Station there exists the possibility of exceeding the CASA thresholds such that pilots should avoid flight in the vicinity of those plumes.

Appendix A
Aviation and Safety of Buoyant Plumes

Clean Air Conference, Newcastle, New South Wales, Australia, 2003

AVIATION SAFETY AND BUOYANT PLUMES

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Summary

Very buoyant plumes generally experience good dispersion but can, in some circumstances, affect aviation safety. Large in-plume vertical velocities can occur in calm conditions with minimal wind shear. Recent civil aviation guidelines seek to restrict the horizontal or vertical extent where average in-plume vertical velocities exceed a threshold that can threaten aircraft performance or structural stability. Key plume calculation procedures require adequate predictions or measurements of vertical profiles of wind and turbulence parameters. The TAPM scheme proves useful but requires additional features for complex source geometry. A hybrid approach overcomes most of these limitations, whilst treating the initial plume development in more detail. Design issues for typical stack configurations are discussed.

Keywords: Plume velocities, stacks, cooling towers, flares, safety

1. Introduction

Over the past 25 years, considerable laboratory, field and theoretical work has been undertaken on the dispersion of very buoyant plumes from industrial sources. Such sources have traditionally included single or multi-flue stacks for major power stations, cooling towers and gas turbine generating plants where large volume flows, together with high exit temperatures, produce some of the highest buoyancy fluxes for normal power station configurations. With the increasing emphasis on gas and similar alternatives for power generation and the recent consideration of stack-in-tower configurations for locations where dry cooling is preferred, highly buoyant plumes are becoming the rule. In addition, industrial flares or unintended releases from pressurised pipelines can yield plumes with large momentum and/or buoyancy fluxes and may have structures approximating line or area sources. Recent dispersion analyses (Weil et al 2001) have shown that very buoyant plumes can readily interact with the overlying inversion and have plume spread dominated by buoyancy for most of the near-field. Plume rise and spread descriptions may need to be revisited.

High buoyancy plumes can, however, give rise to other problems that may require addressing in environmental impact assessments. High buoyancy plumes rise quickly and have significant in-plume vertical velocities. Should the facility be close to local airfields or aviation transport routes, any aircraft encountering the buoyant plumes may experience sufficient vertical uplift and turbulence to cause some temporary disruption to the manoeuvrability of aircraft, especially light commercial (rather than jet) aircraft.

There are no publicly-available field studies that document the decline of in-plume velocities with plume travel time for a variety of conditions necessary to produce validated modelling schemes. Various experimental and theoretical work was conducted around open-cycle and combined-cycle gas turbines at Kuala Lumpur, with field measurements taken for stack-top windspeeds in the range 2-8 m/s (but not for calm conditions). The Cessna aircraft used (Flinders Institute for Atmospheric and Marine Sciences) was fitted out to measure turbulence and air quality parameters as well as aircraft variables. The unpublished results showed a strong decrease of in-plume vertical velocities with windspeed and height, core vertical velocities a factor of approximately 2 greater than plume-averaged values and significant influences on aircraft handling for near-instantaneous (~ 1 sec) exposures to strong plume velocities, especially if encountered by surprise.

The importance of vertical motion in causing aviation problems is better documented by the number of light aircraft incidents reported during strong convection in Australia (Spillane and Hess 1988). During extreme events, naturally-occurring vertical velocities can reach 8 m/s.

The current studies were conducted for an environmental impact assessment of a 700 MW open cycle gas-fired turbine near an army aviation centre at Oakey in southern Queensland. Previous studies by Spillane (1980) on moist plumes were adapted to treat buoyant plumes from closely located sources in calm and low windspeed neutral conditions (Katestone

Scientific 1997). At the time, there was no model recommended by the Civil Aviation Safety Authority of Australia (CASA) and, indeed, very little guidance internationally as to the manner in which available velocity thresholds should be interpreted. Representations were made and generally accepted that the threshold vertical velocity of 4.3 m/s recommended by Australia and New Zealand authorities should be viewed as a plume-average rather than plume centreline criterion.

Critical (but extreme) aviation conditions are expected to be very light winds and neutral stability to heights of 500 m or more. For most assessment sites, there is unlikely to be a substantial database of near-surface and upper-level wind and temperature information to estimate the frequency of occurrence of such rare cases. Recognising this, CASA recently recommended the use of the CSIRO TAPM model for producing long-term databases of such profiles at any location within Australia and for providing a publicly-available method of calculating plume vertical velocities in the near-field of a single plume source (CASA 2003). The TAPM treatment of plume rise (Hurley and Manins 1995) uses coupled non-linear first-order differential equations for the plume volume G, buoyancy F and momentum M fluxes that are generalisations of the original Briggs (1975) plume rise formulation, based on the work of Glendening et al (1984) for stable atmospheres with complex structures. The TAPM scheme does not include any influence of source-altered flow fields or moisture content. It is also strictly valid only for single sources, with multiple sources being treated only via use of a plume enhancement factor, a relatively coarse device for describing near-field plume dynamics. For cooling tower sources, moisture emissions, the confluence of adjacent plumes and the influence of suction occurring due to tower bypass flow can be important (Rezacova and Sokol, 2000). This paper restricts attention to essentially dry plumes with no interactions with distorted flow fields.

Aviation safety risk assessments require the evaluation of concurrence of adverse vertical velocities with the presence of aircraft in the vicinity of the plume and a spectrum of aircraft types and pilot skill. Ideally, a generalised scheme should facilitate the prediction of likely pilot response to such events but publicly-available schemes are not yet available. As for many air quality problems, the main difficulties are assessing the relevance of traditional techniques to the forecasting of extreme conditions and determining the reliability of such assessments based on existing knowledge.

The present paper outlines the available plume calculation methodologies for the Spillane and TAPM approaches, addresses the modifications necessary for multiple sources and assesses the utility of the various schemes for dispersion and meteorological modelling in providing initial and detailed assessments. The high buoyancy of the plumes diminishes the utility of various design alternatives such as increasing stack separation, reducing exit velocity and changing the orientation of discharge. Practical measures are discussed.

2. General considerations

For the generic stack problem, we choose the case of multiple but identical sources of high initial exit velocity and temperature but low enough water vapour content to neglect latent heat considerations. In light winds, influences of the aerodynamic wakes or other effects of stack or cooling tower structures can be neglected. The initial stage (exit conditions) is assumed to be a plume emanating from a stack of height h_s and diameter D, with plume exit velocity either uniform over the cross-section (with a value V_{exit}) or, more likely, a non-uniform velocity profile with plume average velocity V_{exit}. The exit virtual potential temperature θ_s, volume flow $\pi D^2 V_{exit}/4$ and initial buoyancy flux $F_o = gV_{exit} D^2 (1 - \theta_a/\theta_s) / 4$ are readily calculated, with θ_a denoting ambient conditions. The ambient airspeed at stack top is denoted u_e with $K_o = V_{exit}/u_e$ being the initial plume to ambient velocity ratio.

An outline is given in the following sections of the Spillane and TAPM plume dynamics modules for single plumes (retaining their respective notations). The physical interpretation of the processes is outlined in Section 3 with the additional considerations needed for multiple plumes.

2.1 Spillane methodology

The plume radius a, orientation ϕ and velocity V are followed along the plume trajectory. Five equations are solved numerically for the normalised vertical velocity $K = V/u_e$:

Radial growth of a forced-plume bending in a wind:

$$\frac{da}{ds} = \beta_n \cos\phi / K + \beta_e \left| 1 - \frac{\sin\phi}{K} \right| \qquad (1)$$

Rate of entrainment, E, into the plume:

$$2E / V = (\frac{da}{ds} + (\lambda^2 \cos\phi) / 2F_r^2) / (1 - \sin\phi / 2K) \qquad (2)$$

Momentum flux, Va, (longitudinal)

$$\frac{d(Va)}{ds} = 2E - V \frac{da}{ds} \qquad (3)$$

Trajectory curvature; transverse momentum flux

$$\frac{d\phi}{ds} = \left(2\, Ea\, u_e \cos\phi - \left(F \sin\phi\right) / 2.25V\right) / \left(Va\right)^2 \qquad (4)$$

Flux of heat:

$$\frac{d\left(Va^2 \Delta\theta / \theta\right)}{ds} = 0, \text{ in a neutral environment} \qquad (5)$$

where the notation is as follows:

a = plume top-hat radius;
s = distance along plume trajectory;
ϕ = angle of plume centre line to vertical ;
K = V/u_e;
V = plume-averaged speed.
β_n = 0.40; β_e = 0.16; λ = 1.11;
F_r^2 = Froude No = $V^2/(ag\Delta\theta/\theta)$
F = flux of buoyancy = $\lambda^2 a^2 Vg\ \Delta\theta/\theta$; $\Delta\theta = \theta_p - \theta_e$ and suffices p and e for plume and environment.
θ = virtual potential temperature.

Initial conditions for ϕ, V, a and z are set for the end of the momentum rise stage (for a single plume) or at the end of the merged plume stage (for multiple plumes). An along-plume distance step of Δs = 20 m is used, and the appropriate value of $u_e(z)$ adopted for non-uniform profiles.

For the case of calm conditions, analytic solutions are possible, one for the product Va at any height, the other a linear increase of a = 0.16 (z - z_v) where the virtual source height (above stacktop) z_v = 6.25 D [1 - $(\theta_e / \theta_s)^{1/2}$]. For z > 6.25 D > z_v we have:

$$(Va)^3 = (Va)_o^3 + 0.12\,F_o\left[(z - z_v)^2 - (6.25D - z_v)^2\right]$$
$$where\ (Va)_o = V_{exit}\,D/2\left(\theta_e/\theta_s\right)^{1/2} \tag{6}$$

2.2 CSIRO TAPM methodology

The TAPM mean plume rise estimation takes the Glendening et al (1984) approach but assumes that the horizontal plume velocity instantaneously takes up the ambient horizontal velocity at stack height. Cartesian co-ordinates are adopted. The differential equation for plume volume flux G:

$$\frac{dG}{dt} = 2R\ w_p\left(\alpha\, w_p + \beta\, u_e\right) \tag{7}$$

neglects a third term due to ambient turbulence entrainment. $w_p = \frac{dz_p}{dt}$ is the plume vertical velocity, α = 0.1 and β = 0.6 are vertical and bent-over entrainment coefficients and R is the plume radius. For the buoyancy flux F, it assumes:

$$\frac{dF}{dt} = -\frac{sM}{u_p}\left(A\,u_a + w_p\right) \tag{8}$$

where $s^2 = \frac{g}{\theta_a}\frac{\partial\theta_a}{\partial z}$ gives the ambient buoyancy frequency (s = 0 in neutral conditions), $u_p^2 = u_e^2 + w_p^2$, A = 1/2.25 and M is determined by $\frac{dM}{dt}$ = F (= F_o in neutral conditions). By definition,

$$G = \frac{\theta_e}{\theta_p}u_p R^2,\ F = g u_p R^2\frac{\Delta\theta}{\theta_p},\ u_p R^2 = G + F/g,$$
$$w_p = M/G \tag{9}$$

Initial conditions are set with G, F and M evaluated with $w_p = V_{exit}$, R = R_s = D/2 but with the initial integration having

$$R = R_o = R_s\left(V_{exit}/\left(u_a^2 + V_{exit}^2\right)^{1/2}\right)^{1/2} \tag{10}$$

The plume rise height is terminated when F = 0 and plume and ambient dissipation rates are equal. The plume dimensions are based on R = 0.4 (z - h_s) or equivalent prescriptions.

3. Treatment of multiple plumes

For N multiple, identical sources with stack separation d, Table 1 summarises the expected multi-stage plume development as well as Figure 1. The first stage is the rapid (almost vertical) rise of the individual plumes due to their momentum. The external surface of the plume entrains air as it rises (and the vertical velocities are reduced). The end of the momentum-dominated phase occurs when this entrainment reaches the plume core, the plume centreline has a vertical velocity equal to V_{exit} and the velocity profile will be essentially Gaussian. The peak (core) vertical velocity is therefore V_{exit} but the plume average value is 0.5 V_{exit}. Conservation of momentum therefore requires the plume width to have effectively doubled from its initial value a_o.

In this first phase, the plume travels a height of 6.25 D in calm conditions and 0.4 $K_o a_o$ for K_o reasonably large (based on laboratory experiments). Davidson (1994) has also shown that an analytic form for plume rise in a uniform wind has an initial component of 6.2 D exp (-3.3/K_o).

In the second stage, the plume dynamics and trajectories respond to ambient conditions, with much cooler air being entrained into the stack plume. The buoyancy of the plumes has significant influences on the rise as this air mixes into the plume and provides dilution of the exhaust. This dilution is very sensitive to ambient wind speed. For multiple plumes from closely-spaced stacks, this leads almost immediately to a height at which two plumes first touch each other (and plume merging commences) when the effective plume radius is equal to half the stack separation (this is exact in calm winds and approximately correct for light winds). Total merging is assumed to occur when the single plume radius equals stack separation. Conservation of buoyancy flux and Froude number (a reasonable assumption for coherent plumes) leads to a conclusion that the plume radius and vertical velocity will be increased overall by a factor of $2^{0.25}$ = 1.189 by the merging of 2 adjacent plumes.

For more than two stacks, the situation is more complex. In calm conditions, the combined plumes from pairs of stacks will coalesce shortly after to form a coherent plume, assumed to be complete before the single plume radius, a^{sp}, is ½ d (N-1) At this height, the combined plume velocity V_m and radius a_m are $N^{0.25}$

greater than for a single plume. For non-calm conditions, a simplified treatment shows that total merging is likely to occur soon after the merging of two adjacent plumes, for winds at right angles to the line of separation of the stack. For winds at smaller angles ω to the line of stacks, the process is more sequential and the effective stack separation can be reduced by a factor proportional to cos ω.

In the third stage of plume development, plume rise is due entirely to the buoyancy of the (merged) plume and continues until there is an equalisation of turbulent conditions within and outside the plume. The effective average vertical velocity is then close to zero. The third stage of plume development can then be treated as that of a single merged plume (with different initial conditions for a, V and ϕ) passing through different atmospheric layers with varying horizontal velocity u_e. The Katestone software uses a simple successive substitution method to determine a, E (the entrainment), V and ϕ in that order. These equations are valid up to a critical value of ϕ_c ($\phi_c < \pi/2$) at which either the assumptions become invalid or plume rise should be effectively terminated.

These equations can be used in the second stage prior to plume touching and in the third stage once merging has been completed. Plume height is calculated by aggregating Δs cos ϕ, centreline displacement by aggregating Δs sin ϕ. For each Δs, the appropriate ambient windspeed is determined by linear interpolation (or power law curve fitting of available meteorological profile measurements or predictions).

A fourth stage can occur if the coherent plume reaches the base of the overlying inversion (height Z_i). Some of the plume will punch through the inversion base, albeit with reduced vertical velocity. The remainder will be effectively trapped within the inversion layer with essentially zero vertical velocity. Weil et al (2001) show that the penetration in convective conditions depends on $F_*^{2/3}$ where $F_*=F/(u_e w_*^2 Z_i)$ and w_* is the convective velocity scale. There is as yet little guidance on plume dimensions and vertical velocity for the penetrative component.

Table 1: Key parameters for the various stages of development for merging plumes.

Stage	Average plume velocity		Plume width	Plume height	Plume angle	Comments
	Vertical	Horizontal				
Stack exit	V_{exit}	0	a_o	h_s	0°	
End of jet phase	0.5 V_{exit}	$u_e(z) + V \sin \phi_o$	$2a_o$	$h_s + z_o$	ϕ_o	$z_o = K_o a_o < 6.25D$
Plumes first touch	$V_t \cos \phi_t$	$u_e(z) + V_t \sin \phi_t$	a_t	z_t	ϕ_t	$V_t < 0.5\ V_{exit}$
End of plume merging	$V_m \cos \phi_m$	$u_e(z) + V_m \sin \phi_m$	a_m	z_m	ϕ_m	$a_m \approx N^{1/4} a^{sp}$ $V_m \approx N^{1/4} V^{sp}$
Coherent merged plume	$V \cos \phi$	$u_e(z) + V \sin \phi$	a	z	ϕ	$V < V_m$ $a > a_m$
Maximum plume rise	0	$u_e(z) + V \sin \phi$	a_c	z_c	ϕ_c	$\phi_c < 90°$
Inversion interaction	Low	Shear-affected	Enhanced	$> Z_i$	Variable	(Weil et al 2001)

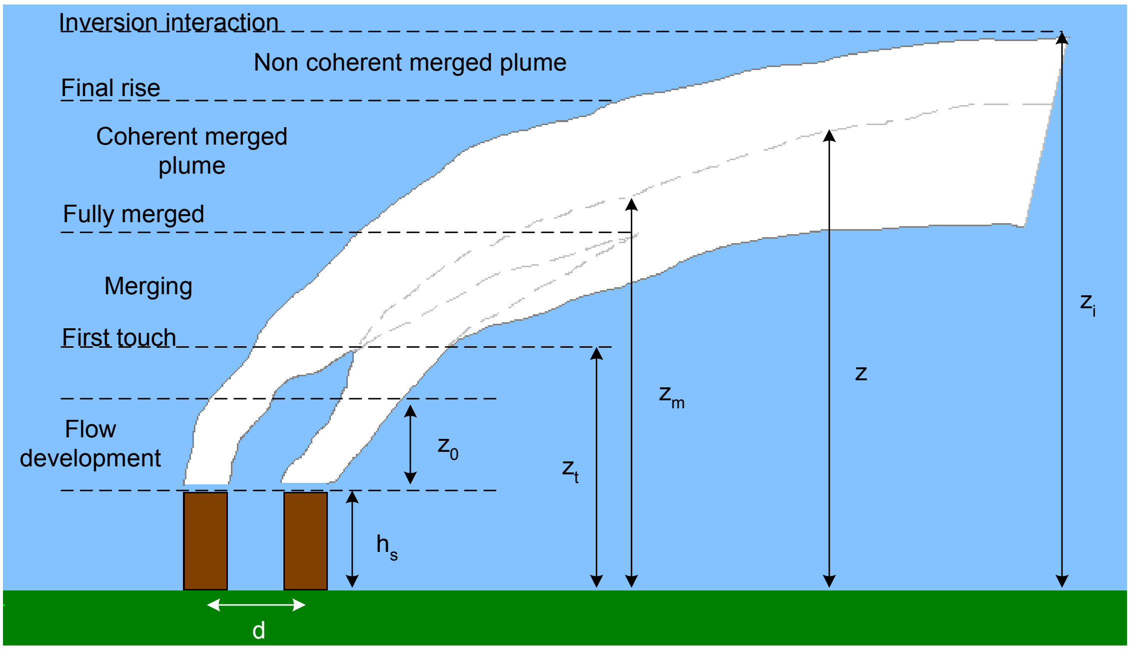

Figure 1: Schematic of plumes merging.

4. Illustrative examples

The simplest cases assume identical sources with stack separation d operating in a neutral and unbounded atmosphere with uniform conditions. For the Spillane approach, Table 2 gives the resulting plume-average vertical velocities for the cases with V_{exit} = 38.9 m/s, h_s = 35 m, F = 2300 m^4/s^3 and N = 1 and separately N = 2 with d = 25 m.

The heights experiencing threshold exceedances are dramatically reduced going from calm to light winds. The TAPM approach for single plumes gives similar results if some allowance is made for an initial displacement offset z_0 (Figure 2).

Table 2: Plume average vertical velocities (m/s) for uniform calm and light wind conditions in a neutral atmosphere

Height	Calm		u_e = 1.5 m/s		u_e = 3 m/s	
	Single	Double	Single	Double	Single	Double
100	12.2	12.2	9.0	9.3	6.9	8.3
200	7.8	9.2	5.5	7.0	3.6	5.1
300	6.5	8.0	4.4	5.8	2.6	3.9
500	5.3	6.6	3.2	4.5		2.8
700	4.8	6.0	2.6	3.7		2.2
1000	4.1	5.2				

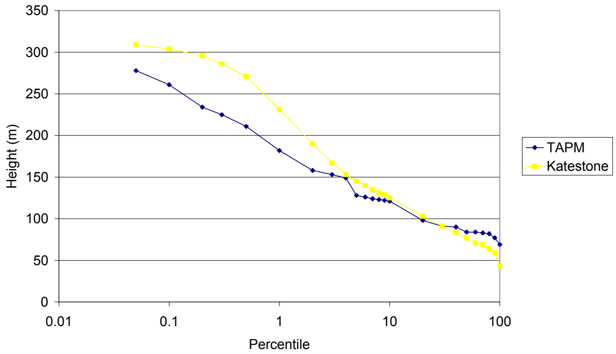

Figure 2: Comparison of methodologies for plume height calculations for a 5 year period.

5. Meteorological modelling

Meteorological inputs are critical for a reasonable treatment of risk, especially for near-calm conditions at stack-top and above. Unfortunately, it is these very conditions under which near-surface measurements (together with stability-dependent profile laws) or TAPM-like prediction methodologies are likely to be poor indicators of actual conditions, at least for inland sites (Jackson et al 2003). Presumably this quandary lead CASA to recommend the TAPM approach. If measurements are available from a nearby 30-100 m tower, we would recommend their use unless TAPM results are carefully tuned to the appropriate surface conditions.

Recent project work near Williamtown Airport gave a comparison of five years of hourly TAPM results with available balloon and 30 m tower measurements. The main conclusions were:

- Moderate interannual variability in the actual and predicted occurrence of light winds at 30 m and above.
- TAPM tends to underpredict the frequency of occurrence of very light winds (< 1 m/s) compared to tower observations (typically 1.2 - 3.5% compared to 5.7 - 14.9%).
- For available balloon profiles, TAPM overpredicted the frequency of very light winds at 600 m and 900 m agl.
- Very few measurements are available in the crucial 100-500 m height range.

6. Synthetic approaches

The Spillane approach has been adapted to take in the TAPM wind profile conditions. Figure 3 compares the cumulative probability distributions for critical heights (where the in-plume average velocity drops below 4.3 m/s) obtained by using either the TAPM wind predictions or the interpolated measured winds, for the case of two 35 m high, 54 m separated combined-cycle units of total capacity over 800 MW. Close agreement is obtained.

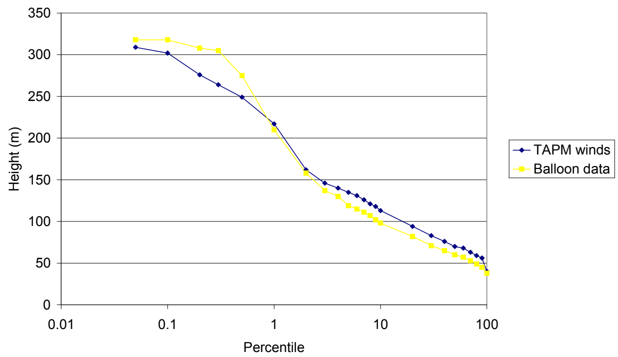

Figure 3: Comparison of Spillane plume height calculations for TAPM - generated and measured winds.

7. Design options

Decreasing the exit velocity will reduce the initial flow development length but plume buoyancy is the key factor in the magnitude of the vertical velocity. Similarly any reduction in stack height gives little benefit to aviation safety concerns and may risk poor plume dispersion in high-wind conditions (due to building wake influences). Increasing the stack separation does delay the time when plumes merge but with little overall practical benefit (Figure 4). Horizontally-pointing stack exits will reduce initial momentum but again buoyancy is dominant.

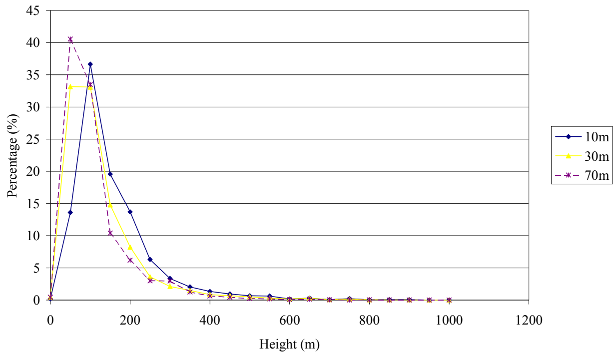

Figure 4: Frequency of critical height for varying stack configurations.

The reduction of plume buoyancy by using heat recovery results in a very significant reduction of critical heights but open-cycle operation usually has to be considered in any risk assessment. For critical cases, it appears better to take advantage of the relatively small zone of influence on vertical velocities and the usual requirement of CASA to identify stack locations for low-flying aircraft. A notice to aircrew together with real-time indication of site operations may be effective in most situations.

8. Conclusions

Methodologies now exist for major point sources and point to the dominating role of initial plume buoyancy. Detailed measurements are required for light-wind conditions and are readily taken by experienced research aircrews. TAPM methodologies are reasonable for single plumes but inappropriate for multiple plumes. For key sites, remote sensing equipment is required to gather reliable wind statistics in the critical 100-500 m range. Theoretical advances are needed to treat inversion penetration in very light-wind conditions and to extend the methods to moist plumes and different source geometries.

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Appendix B
Theoretical Methodology Results

Appendix B
Results of Theoretical Assessment

Height above stack (m)	Plume Radius (m)	Vertical Velocity (m/s)	Height above MSL (feet)
25.3	3.6	13.6	250
40.5	6.0	9.1	300
55.8	8.5	7.3	350
71.0	10.9	6.3	400
86.3	13.4	5.7	450
101.5	15.8	5.3	500
116.7	18.2	5.0	550
132.0	20.7	4.7	600
147.2	23.1	4.5	650
162.5	25.5	4.4	700
177.7	28.0	4.2	750
192.9	30.4	4.1	800
208.2	32.9	4.0	850
223.4	35.3	3.9	900
238.7	37.7	3.8	950
253.9	40.2	3.7	1000
269.1	42.6	3.6	1050
284.4	45.1	3.6	1100
299.6	47.5	3.5	1150
314.9	49.9	3.4	1200
330.1	52.4	3.4	1250
345.3	54.8	3.3	1300
360.6	57.2	3.3	1350
375.8	59.7	3.2	1400
391.1	62.1	3.2	1450
406.3	64.6	3.1	1500

Appendix C
Graphical Results of Modeling Assessment

Figure 1: Maximum vertical velocity at 200 feet ASL (Worst-case Meteorological Conditions)

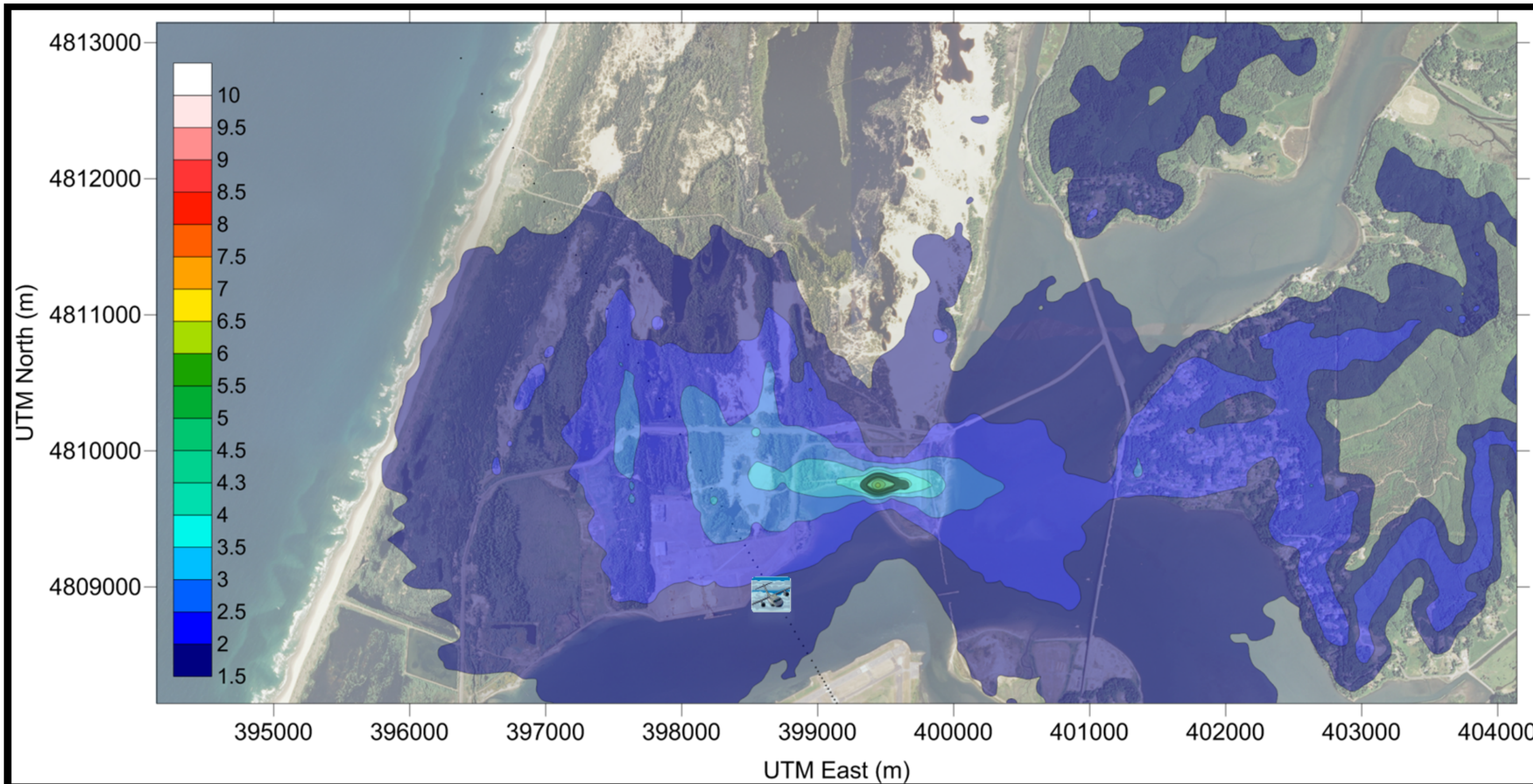


Figure 2: Maximum vertical velocity at 400 feet ASL (Worst-case Meteorological Conditions)

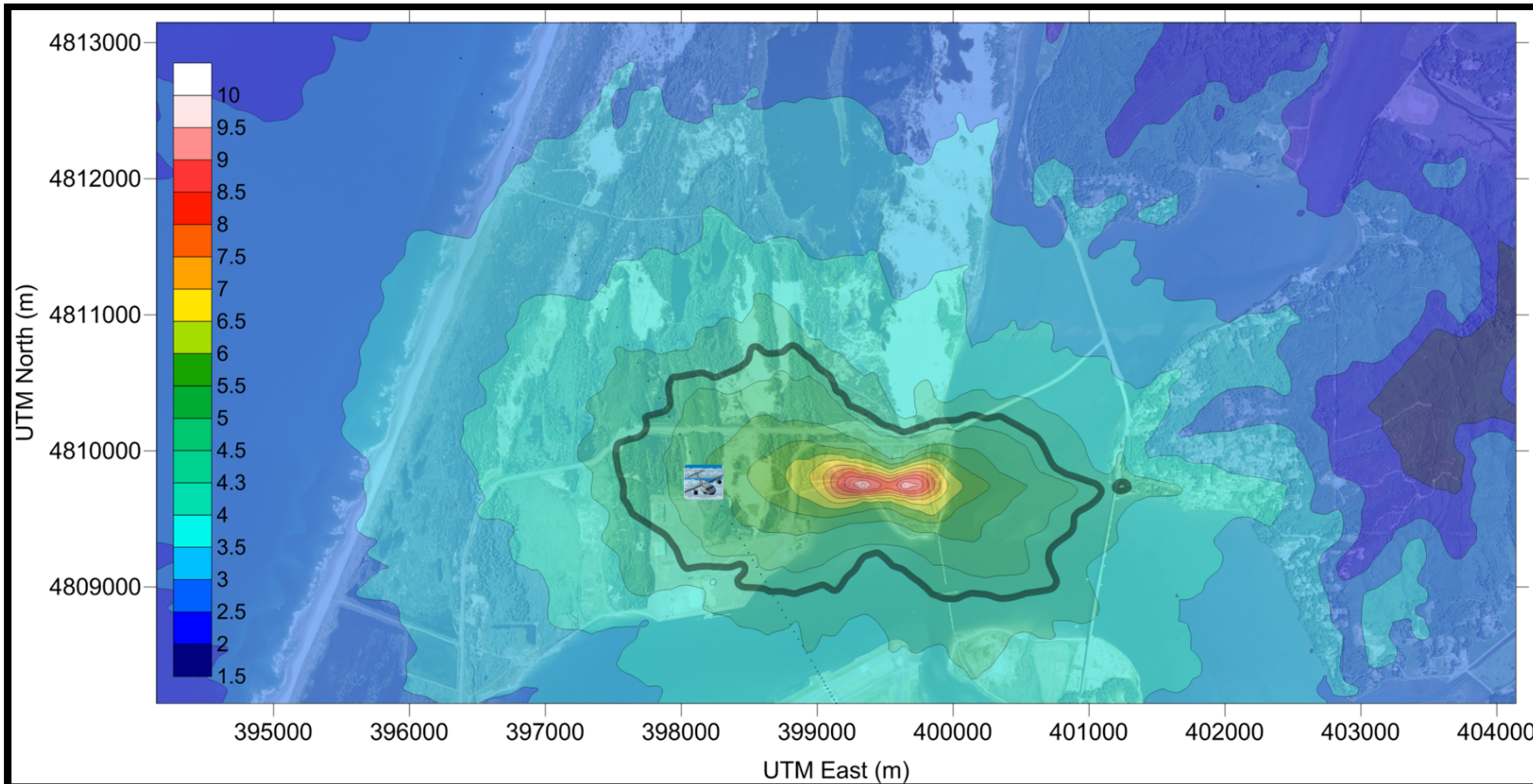


Figure 3: Maximum vertical velocity at 600 feet ASL (Worst-case Meteorological Conditions)

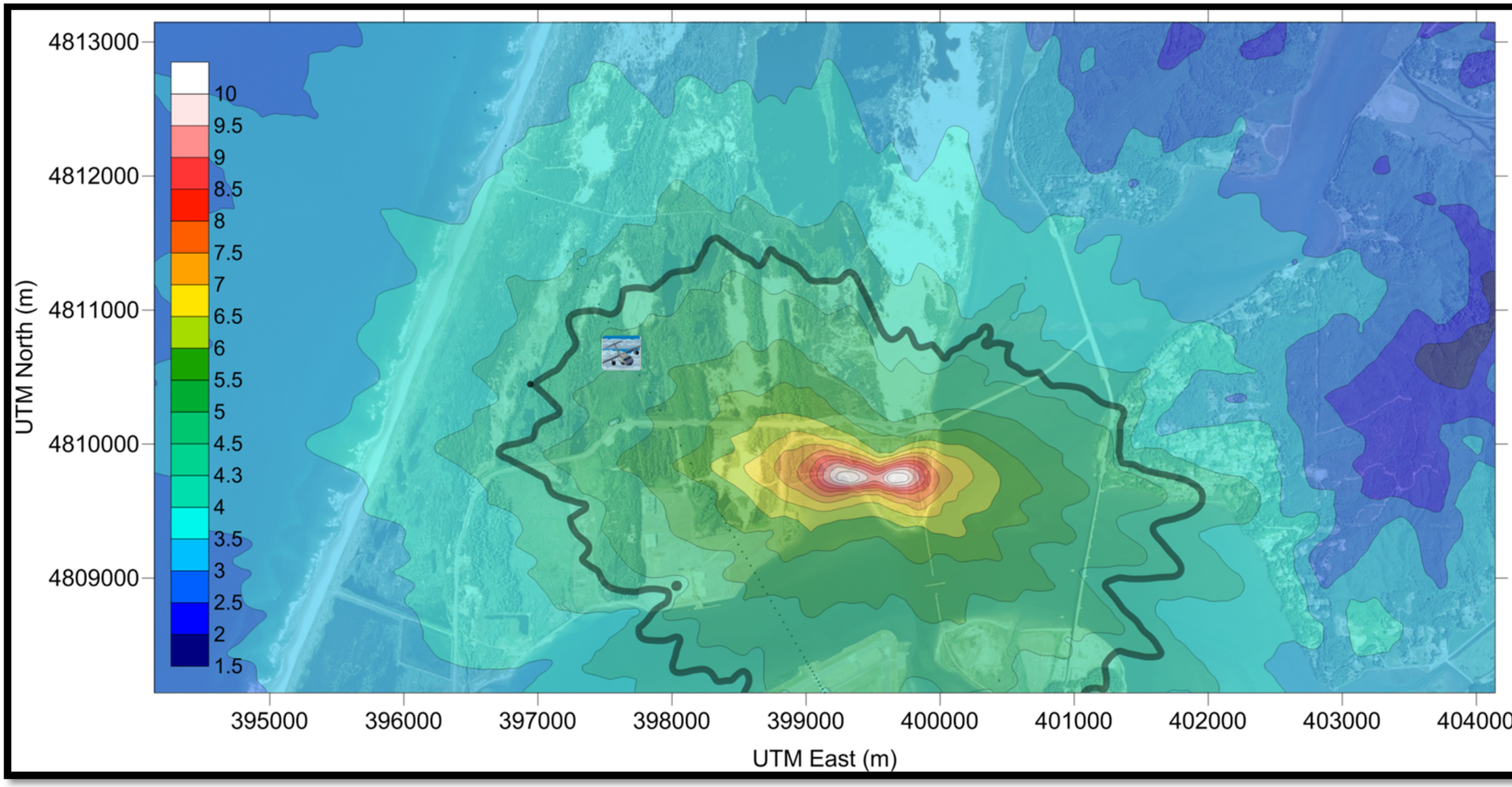


Figure 4: Maximum vertical velocity at 200 feet ASL (Infrequent Meteorological Conditions)

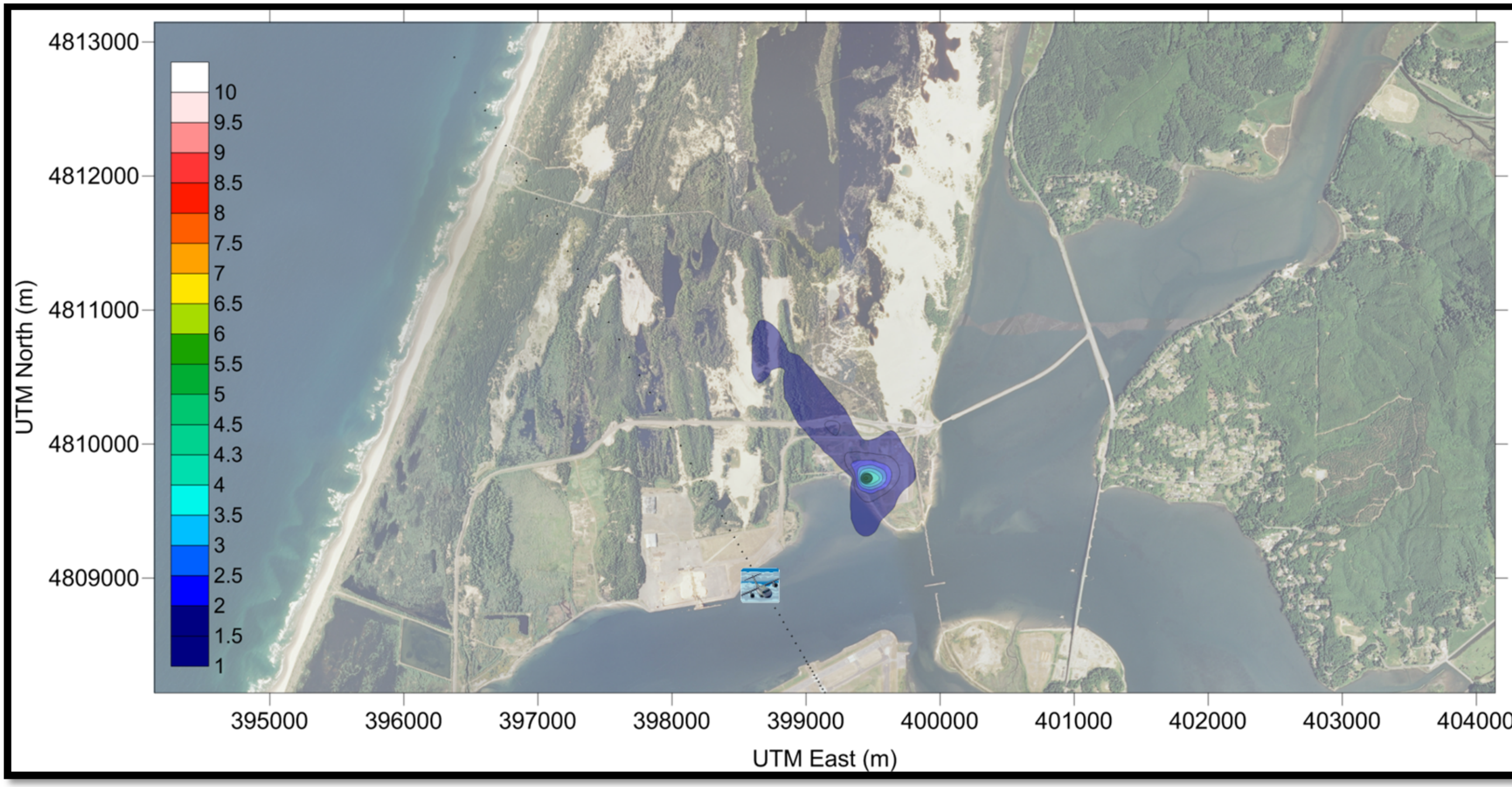


Figure 5: Maximum vertical velocity at 400 feet ASL (Infrequent Meteorological Conditions)

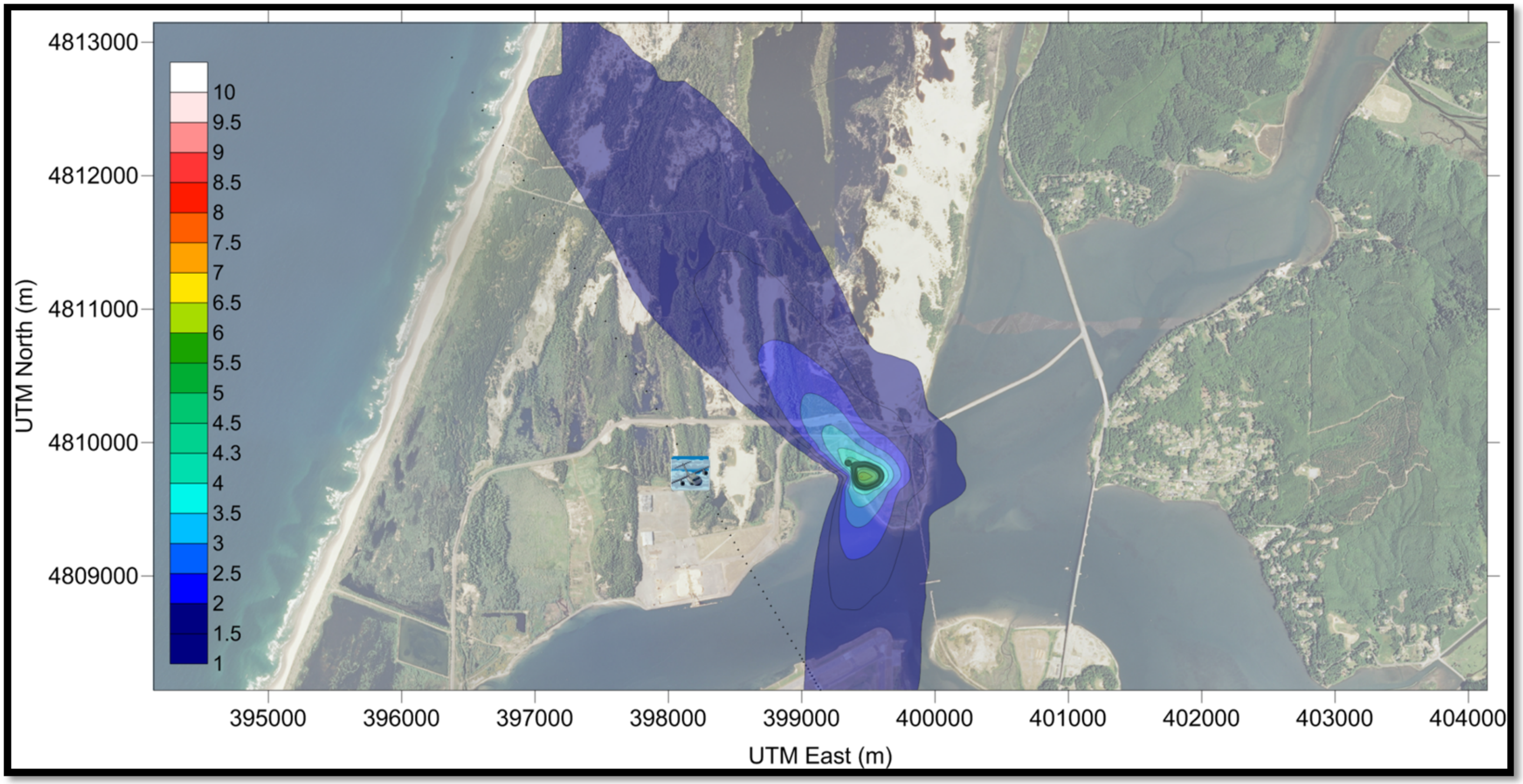
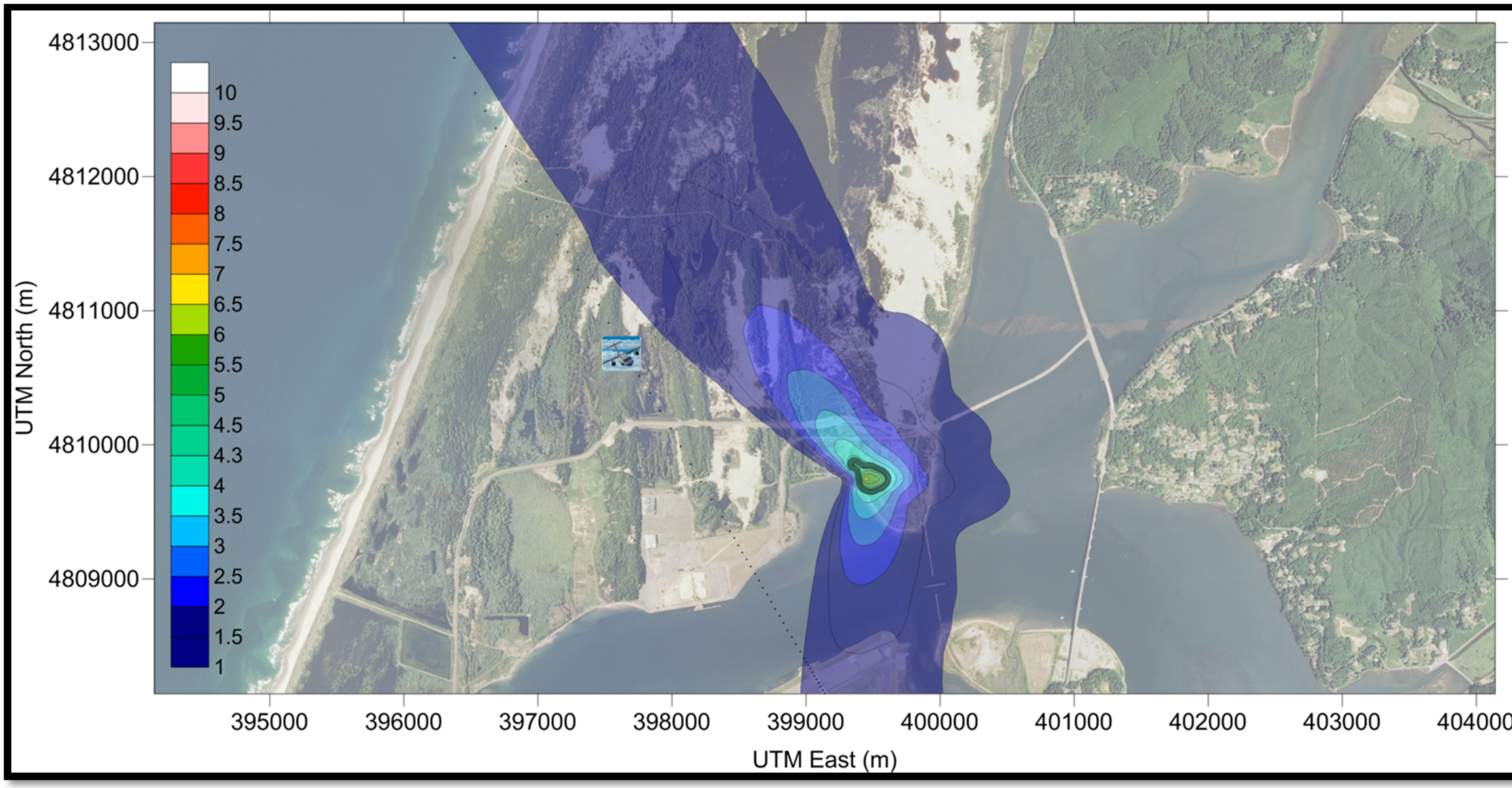


Figure 6: Maximum vertical velocity at 600 feet ASL (Infrequent Meteorological Conditions)



APPENDIX U-7

An Economic Impact Analysis of the Construction of an LNG Terminal and Natural Gas Pipeline in Oregon

An Economic Impact Analysis of the Construction of an LNG Terminal and Natural Gas Pipeline in Oregon

Prepared for the Jordan Cove Energy Project, L.P.

March 6, 2012

ECONorthwest

ECONOMICS • FINANCE • PLANNING

Introduction

The construction of a liquefied natural gas (LNG) project in southwest Oregon has been proposed, consisting of the following two elements (together, the "Project"):

1. the Jordan Cove Energy Project (JCEP), an LNG terminal in Coos County, Oregon; and,

2. the Pacific Connector Gas Pipeline (PCGP), a 234-mile natural gas pipeline connecting the LNG terminal to the Malin natural gas hub in Klamath County, Oregon.

This report describes the results of an impact analysis that measured the effects of the Project's construction activity on the economies of Oregon and Washington. Specifically, this study focuses on impacts from July 2014 through December 2017 when the Project would be built.

JCEP engaged ECONorthwest for the analysis and provided data. ECONorthwest used that data, labor market data from the U.S. Bureau of Labor Statistics and U.S. Census, and economic models in forecasting the economic impacts attributable to the Project's construction.

Economic impacts include job creation, labor income, economic output, and value added. Other potential effects arising from this construction project, including environmental and social, are not addressed in this study.

All costs and impact values in this report are expressed in 2011 dollars. Hence the report does not speculate how much inflation may occur in labor rates, construction materials, and services.

As is typical of economic impact studies, the analysis for the Project covers the four calendar years 2014 through 2017. The averages reported in this analysis are based on this four-year period. However, plans call for the construction of the JCEP terminal to start July 2014 and end July 2017. Pipeline construction would begin July 2014 and end December 2017.

Major Findings

This report summarizes the economic impacts in Oregon and Washington associated with the construction of the JCEP LNG terminal facilities and the PCGP natural gas pipeline.

The major findings of this analysis are:

- The total expenditure on the Project would be $5.354 billion of which $4.494 billion would go into the direct construction of the pipeline and terminal facilities. That represents the Project's direct economic output. Through downstream impacts, total economic output in Oregon and Washington would be $6.641 billion as a result.

- In terms of gross domestic product, which is the overall net value added to the economy due to the construction, Oregon and Washington would experience a total increase of $1.738 billion between 2014 and 2017. Of this, $739 million would occur directly at the construction sites while nearly one billion dollars more would result from non-direct effects that would stimulate additional spending and employment in the economy.

- In the average year from 2014 to 2017, Project construction activities would employ 1,768 workers receiving $182.6 million in compensation. The economic stimulus provided by the construction would cause employment and labor earnings to rise elsewhere in the Oregon and Washington economies. The total annual employment impact is estimated to be 5,137 additional jobs earnings $330.0 million in labor income.

Section II

Background

Economic impact studies measure the annual effects of projects on employment, income, and other economic metrics. Researchers begin by defining the project, the economic area over which the effects are being measured, and the sources of impacts being included or excluded.

Project Description

JCEP and PCGP received Federal Energy Regulatory Commission (FERC) certification to construct and operate their proposed facilities for imports of LNG. In the import mode, LNG would be unloaded at the JCEP terminal and re-gasified back into natural gas that would be stored at the terminal and then transported by PCGP to markets in the western United States for domestic consumption.

The Project developers are now seeking authorization for the terminal and pipeline to be constructed and operated for exports, with the expectation that, during the foreseeable future, the Project will be exclusively an LNG export facility. Natural gas to be exported is anticipated to originate in the extensive shale gas resources of western Canada and the Rocky Mountain states. In the export mode, PCGP will transport and deliver natural gas to the terminal, where JCEP will liquefy the gas into LNG, store it, and then load it onto ships for export.

In 2006, ECONorthwest conducted an economic impact study of the Project as an import facility. This current study measures the impacts of the Project solely as an export facility.

The nameplate capacity of the terminal would be six million metric tonnes a year (MMtpy) of LNG exports. Plans call for the terminal to operate at an average capacity factor of 90 percent. At that level, which allows for seasonal variations, routine upkeep, and market fluctuations, the terminal would export nearly 5.4 MMtpy of LNG.

The PGCP would have a nameplate capacity of 1.1 billion cubic feet of natural gas per day (Bcfd). At a 90 percent capacity factor, throughput would average 0.99 Bcfd. As shown on Table 1, about 0.78 Bcfd would be used in exported LNG, 0.05 Bcfd in terminal operations, and 0.16 Bcfd would be used by other consumers between Malin and Jordan Cove and by the pipeline itself.

Table 1: Project capacity and natural gas use

Capacity Measure	Daily	Annual
JCEP LNG exports, metric tonnes:		
Nameplate capacity	16,438	6,000,000
Projected @ 90% of capacity	14,784	5,396,163
PGCP natural gas throughput, Bcf:		
Nameplate capacity	1.10	401.50
Projected @ 90% of capacity	0.99	361.35
Uses of PGCP natural gas throughput, Bcf:		
Contained in LNG exported	0.78	284.81
Used by the JCEP terminal	0.05	18.73
Used by the PGCP and others	0.16	57.85
Total	0.99	361.39

Source: ECONorthwest analysis of data provided by the JCEP.

LNG Terminal

The LNG terminal and an associated power plant would occupy a total of approximately 360 acres located on the lower section of Coos Bay on the North Spit of Coos County, Oregon.

If run at a 90 percent capacity factor for a full year, the terminal would export nearly 5.4 MMtpy of LNG, which requires approximately 90 LNG carrier vessels to call upon the terminal.

Approximately 6.2 percent of the gas delivered to the JCEP terminal would be either consumed as fuel to operate the liquefaction process or be removed from the feed gas stream (trace sulfur compounds, carbon dioxide, nitrogen and water) prior to or during the liquefaction step. Any hydrocarbons recovered that have a higher molecular weight than methane will fuel the power plant.

The JCEP terminal would have two LNG storage tanks, each with a capacity of 160,000 cubic meters. On-site LNG storage capacity is equivalent to approximately eight days of design production.

Additionally, the terminal would generate its own power through the use of multiple natural gas fired combustion turbines operating in combined cycle. Initial estimates have sized the power plant at 350 megawatts (MW) with sufficient redundancy in generation equipment to allow the JCEP facility to be self-sufficient with reserve generation to ensure that the 90% or greater plant availability is maintained. Approximately 10 - 20 MW of excess power is proposed to be available from the facility in order to stabilize the regional power grid.

Pipeline

The PCGP is a 234 mile, 36” diameter pipeline that will connect the JCEP terminal in Coos County to the natural gas market hub at Malin, Oregon. No significant changes in the design of the PCGP are anticipated to provide for the capability to deliver gas to Coos Bay from Malin in addition to the previously approved design for the delivery of gas from Coos Bay to Malin.

Natural gas will come from sources in Canada and the U.S. Rockies. Canadian gas would be delivered to Malin *via* the existing Gas Transmission Northwest (GTN) pipeline. Natural gas from the Rockies would be delivered to Malin through the newly operational Ruby Pipeline. A single natural gas compressor station at Malin will allow the PCGP to transport 1.1 Bcfd to JCEP terminus in Coos County.

The JCEP would use about 84 percent of the pipeline’s throughput when operating at 90 percent of nameplate capacity.

Economic Area

The appropriate area for an impact study is one that encompasses where the direct construction activities occur and where workers, supplies, and services used in that construction predominantly come from.

Given the Project’s size and complexity, it would draw in resources from throughout Oregon and Washington. This is especially true for labor. In response to previous research inquiries, trade unions notified ECONorthwest that they had sufficient numbers of members skilled in the types of construction needed for the Project and that most would come from Oregon and some from Washington.

Natural gas pipeline construction labor and JCEP project management are more specialized. About half of these workers would come from outside the two-state region.

Besides labor, the two states can supply many of the services and materials needed for construction. Therefore, this study defines the economic area as the states of Oregon and Washington combined.

Impact Sources

The principal source of impacts would arise directly from construction activity in Coos County as well as nearby Jackson, Douglas, and Klamath counties where portions of the pipeline extend. There would also be some impacts from about $7.7 million of contractor payments for logging, hauling, and clearing timber in the right of way.

Household spending by jobholders residing in Oregon and Washington is another major source of economic impacts. For workers, household spending affects the economy to the degree that they spend their earnings in Oregon and Washington. Impact analysis accounts for earnings used for taxes, savings, or spending outside the two states. Such uses have no impacts on the local economy.

For nonresident Project employees, the analysis counts only those workers' *per diems* as a source of economic impacts in the study area. Spending of their wages and salaries occurs largely outside of the study area of Oregon and Washington; therefore, those downstream impacts are not counted in this analysis, which focuses only on the economic impacts within Oregon and Washington.

The analysis also excludes certain project expenditures that are not typically considered in economic impact studies. These include asset transfers, property and sales taxes, interest during construction, working capital, and purchases from suppliers outside the study area of Oregon and Washington. Examples of asset transfers are land purchases, payments for right of way, and payments for timber.

Project Construction Costs

Project construction cost estimates used in this analysis were current as of March 2012, but are subject to revisions as detailed designs evolve. The basis for the estimates shown in this report are of a pipeline and an export terminal designed with sufficient pre-investment to readily install import capability in the future.

JCEP Project Manager, Mr. Bob Braddock, provided ECONorthwest with construction cost estimates, adjusted to 2011 dollars, for both the pipeline and LNG terminal. He also forwarded terminal construction labor data from Black & Veatch, the engineering, procurement, and construction firm for the JCEP. ECONorthwest distributed construction cost contingencies across expenditure activities.

As shown in Table 2, the total cost for the Project is $5.354 billion.

Table 2: Project construction costs and direct impacts by activity and element, millions of 2011 dollars

Expenditure	Total Project Cost	Direct Construction Impacts	JCEP Portion	PCGP Portion
Marine facilities	$146	$146	$146	-
LNG tank systems	380	380	380	-
Liquefaction plant	1,331	1,331	1,331	-
Power plant	420	420	420	-
Pipeline construction	1,333	1,333	-	$1,333
Pipeline right of way timber	45	-	-	-
Pipeline easement & damage payments	17	-	-	-
Right of way payments	10	-	-	-
Road, utility infrastructure	7	7	7	-
Marine, safety infrastructure	46	46	46	-
Taxes	9	-	-	-
Land for the JCEP	100	-	-	-
JP project & const. management	25	25	25	-
JCEP pre-opening expenses	17	17	17	-
Development phase contingencies	66	66	66	-
JCEP escalation & contingency	573	573	573	-
PCGP escalation & contingency	150	150	-	150
Interest during JCEP construction	680	-	-	-
Total Expenditures	$5,354	$4,494	$3,011	$1,483

Sources: ECONorthwest analysis of data provided by Bob Braddock, Vice President – Project Manager of the JCEP, memos dated 12/19/11, 12/27/11, and 1/3/12.
Note: Not included are pipeline pre-development expenses, interest, and land purchase costs.

For the purposes of measuring the economic impacts of construction, certain expenditures are excluded. As noted on Table 2, land purchased for the terminal and other real estate payments (a $100 million asset transfer), capitalized interest ($680 million), and several other items are not counted. Although they are Project costs, they are not sources of construction output. Therefore, the value of construction that would be put in place totals $4.494 billion.

The $4.494 billion is the direct output of construction. About $3.011 billion of the direct construction would be attributable to the JCEP terminal and related facilities. The pipeline accounts for the remaining $1.483 billion of construction spending.

At $4.494 billion in direct construction costs, the value of the proposed Project is very large, exceeding that of construction spending on all similar projects in Oregon over the last five years. From 2007 through 2011, $4.435 billion was spent constructing power plants, natural gas pipelines, communication utilities, transmission infrastructure, and manufacturing buildings in the entire state.[1]

The analysis measured the downstream economic effects of these direct construction impacts on the study area.

Constructing both the JCEP and PCGP would require specialized equipment and materials that are only available from suppliers outside the study area. As Table 3 illustrates, of the $4.494 billion in total construction spending, $1.366 billion would be spent in Oregon and Washington. Much of the $1.366 billion would be re-spent within the study area, generating successive rounds of secondary impacts. This would continue until the money eventually exits the economy through savings, taxes, and purchases made outside of the two states.

[1] Spending on new, additions, and alterations on utility infrastructure and manufacturing buildings as reported by McGraw-Hill Construction Research & Analytics for the years 2007 through 2011, in emails to R. Whelan (ECONorthwest) from Shawn LaRoche, Economic Analyst, McGraw Hill. The most recent data received on February 20, 2012.

Table 3: Project expenditures by geography[2] and category, in millions of 2011$

Project Component	Oregon and Washington	Elsewhere	Total
JCEP			
Employee compensation	$364	$48	$412
Materials	$134	$315	$449
Equipment	$20	$573	$594
All other expenditures	$499	$1,058	$1,557
PCGP			
Employee compensation	$130	$188	$318
All other expenditures	$219	$946	$1,165
Total	**$1,366**	**$3,128**	**$4,494**

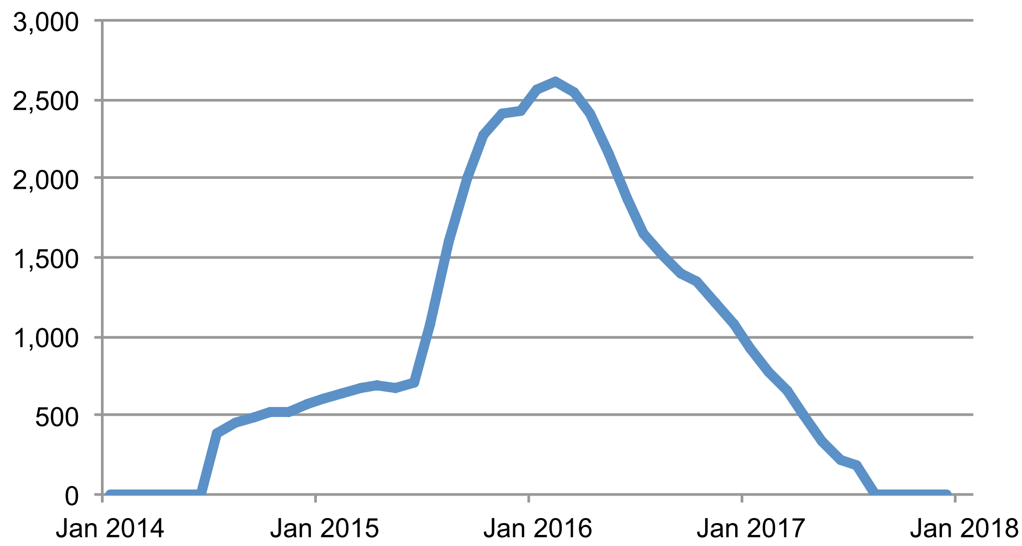
Sources: ECONorthwest analysis of data provided by Bob Braddock, Vice President – Project Manager of the JCEP, memos dated 12/19/11, 12/27/11, and 1/3/12; IMPLAN.

Construction Schedule

Black & Veatch provided workforce estimates for the LNG facility's construction period from July 2014 to July 2017. The prime contractor for the Project would obtain its workers through direct hiring and subcontractors. In addition there would be construction and project management employees. These and an adjustment for construction contingencies were added to the totals shown on Figure 1.

[2] Labor payrolls will be made in Oregon for work performed in the state during construction. The portion shown as being "elsewhere" on Table 3 is compensation to employees that reside outside of the two-state study area.

Figure 1: JCEP workers on site per month



Source: JCEP manpower forecast by Black & Veatch received by ECONorthwest from JCEP in an email dated December 19, 2011. Employment adjusted by ECONorthwest to reflect current project specifications, cost estimates, and contingencies.

Employment peaks in February 2016 at 2,612 workers, but averages 931 over the four-year period.[3] JCEP alone will require about 7.7 million total worker-hours of employment. Approximately half of JCEP's management staff is expected to come from outside the study area.

The construction of the JCEP facilities will require highly skilled tradespeople, including electricians, pipefitters, metalworkers, and cement masons. The Project will use union labor, drawing on the available workforce in Oregon and Washington.

For the PCGP, ECONorthwest estimated, based on pipeline construction worker compensation rates, that pipeline construction would employ an average of 837 workers over four years. Construction labor will cost about $318 million.[4]

Workers living in Oregon and Washington are expected to comprise half the PCGP workforce and earn a combined $130.2 million. Workers from outside the study area would earn higher wages because of their more specialized skill level. For those itinerant employees their contribution to the study area economy would come solely from their *per diems*, which PCGP projects will total $40.7 million.

For the entire Project (terminal and pipeline), direct employment will average 1,768 jobs a year over four years. Total direct labor income would be $730 million.

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[3] The construction estimates provided by JCEP assume 2,080 working hours per year.

[4] Average compensation calculated based on median wages for pipefitters in Oregon, reported by the U.S. Bureau of Labor Statistics 2010 Occupational Employment Statistics.

Economic Impacts

The enormity of the Project is such that it would necessarily attract construction labor and rely on suppliers from throughout the study area. Currently, there is ample slack in the construction sector, which has seen its employment drop in Oregon and Washington by more than 103,000 jobs since 2007.[5]

Project spending and employment from within Oregon and Washington will cause direct economic impacts that would filter down through the economy causing additional hiring, spending, and other economic activities.

ECONorthwest analyzed construction planning and forecast data provided by the Project's development team. Spending and payroll impacts that would occur outside the borders of Oregon and Washington were excluded.

Economic Impact Analysis

This impact analysis measures the annual effects of the Project for each of the four construction years from 2014 to 2017. As the initial direct impacts of $4.494 billion, apportioned over the years based on construction schedules, spread to other parts of the economy, subsequent *secondary* impacts occur. These are estimated using an economic impact model of Oregon and Washington. This model counts all the effects of labor and spending at the construction project, as those direct effects filter down through an economy *via* local spending by the Project, its subcontractors, local suppliers, and affected employees.

Economic Impact Model

ECONorthwest estimated the impact of construction for the Project using the economic modeling software IMPLAN (Impact Analysis for Planning). IMPLAN calculates economic impacts in a transparent manner using well-known and robust data sources for its calculations. This transparency allows for the inclusion of data specific to the Project, rather than relying on industry averages, which encompass all forms of heavy construction work.

5 Change calculated by subtracting 2011 total employment in construction in Oregon and Washington from 2007 reported by the U.S. Bureau of Labor Statistics in its Current Employment Statistics database available at http://www.bls.gov/ces/.

The Project's development team provided spending and payroll estimates by year and location. ECONorthwest excluded from any downstream effects Project expenditures expected from vendors outside of the Northwest, as these have no significant economic impacts on the study area. ECONorthwest also excluded from having secondary impacts all but the *per diem* spending that would arise from Project construction employees who come from outside of Oregon and Washington.

IMPLAN was developed as a product of the Rural Development Act of 1972 by the U.S. Forest Service in cooperation with FEMA and the Department of the Interior. It is economic modeling software that creates regional input-output models based on county-level data. The Forest Service made IMPLAN widely available. The relationship among university-based researchers, USDA extension specialists, and the Forest Service became bilateral. Researchers and specialists questioned data and assumptions, made suggestions, and recommended changes.

To accommodate this feedback, the U.S. Forest Service privatized IMPLAN and it is now operated by the Minnesota IMPLAN Group ("MIG"). In addition to updating and improving the databases and software, MIG holds regular training sessions, biannual user conferences, and maintains a collection of hundreds of papers that have used IMPLAN.

Industry Data

The IMPLAN model divides the economy into 440 sectors including government, households, farms, and various industries. For each sector IMPLAN allocates spending and employment impacts between the local and non-local economies.[6] The IMPLAN data, derived from U.S. Census and other government sources, approximates how, from where, and on what products and services various local industries spend money. IMPLAN also estimates the employment effects by industry.

ECONorthwest replaced the default estimates of IMPLAN with actual spending and payroll budget data for the Project. When fed into IMPLAN, the impacts of the Project's construction spending and employment, as they flow through the modeled economies of Oregon and Washington, are determined. IMPLAN calculates the total impact by sector, according to the supply lines linking the various economic sectors in the economy.

With each additional transaction away from the source impact (*i.e.*, the initial level of expenditures at Project construction sites), the amounts diminish due to the effects of savings, taxes, or other activities that happen outside the local economy. For what stays local, for each round of spending and the employment it provides, more is added to the initial impact. In the end, the total regional economic impacts exceed the initial impact from the Project. Economists call this the *multiplier effect*.

[6] IMPLAN production function and regional purchase coefficient data were used.

Impact Levels

Transactions (and employment) occur at three different levels depending on how removed they are from the initial source. For this analysis those levels are:

- **Direct impacts:** Those that happen at the initial source, which in this analysis are the Project construction sites and offices that oversee construction activity.
- **Indirect impacts:** An indirect impact is one that occurs because of business-to-business transactions. Thus, when JCEP buys steel from a wholesaler in Eugene, Oregon, that purchase causes an indirect impact in the form of higher output, employment, and business income for the steel service center. That would also represent a first round of indirect impacts. An example of a second round would be if the service center buys the steel it sells to the terminal from a mill in Portland, Oregon. That too is a business-to-business transaction causing an indirect impact. Spending by the Project from a supplier outside the study area shows up as a direct impact, but not as an indirect impact.
- **Induced impacts:** An induced impact is one caused by household spending. For example, a pipeline welder working on the PGCP who spends his wages on groceries from a store in Roseburg, Oregon causes a first round of induced impacts. If store employees or its owner earn more money because of the increased business coming from the pipeline's construction, their increased household spending causes a second round of induced impacts. Because induced impacts originate from household spending, they often are called "consumption-driven" effects. Induced impacts of workers living in the study area are greater than those based elsewhere (itinerant workers). Resident workers spend most of their wages and benefits in the study area. Itinerant worker induced impacts are limited to what their *per diems* cause.

Direct impacts are sometimes referred to as *primary* impacts because they start where the primary sources of economic activities occur. Induced and indirect together are called *secondary impacts*, and they happen largely away from the primary sources.

The value of IMPLAN is that it can estimate all of the eventual secondary impacts, well beyond the first and second rounds.

Types of Impacts

Impacts are reported using economic measures, such as jobs and income that, while not additive, do provide alternative perspectives for expressing the size of economic effects. The measurements used in this report are:

- **Jobs:** The annual average number of employees, both payroll and self-employed, for either full- or part-time work on the construction project. An annual average is work for twelve months. Therefore, seven months of work by a steamfitter on the LNG terminal plus five months of work by a pipeline welder counts as one job for one year even though two different people in two different occupations were employed for part of the year.
- **Employee compensation:** Payroll cost of employers. It is the sum of wages, salaries, benefits (*i.e.,* health insurance, vacation pay, retirement), and employer paid payroll taxes. In this study, payrolls of the general contractors and trades at the construction sites are counted as being direct impacts.
- **Proprietor income:** Earnings of self-employed workers and farmers in the local economy. This includes owner-operator businesses.
- **Labor income:** The sum of employee compensation and proprietors' income.
- **Output:** For construction projects, output is the cost of building and completing structures. This includes the cost of equipment, engineering, project management, and other expenses of assembling physical structures. Land and financing are not part of construction output. Direct output is the value of construction put in place even though many components and services used in the building process may be non-local.
- **Value added:** For construction projects, value added is the most useful overall impact measure because it estimates the net contribution of a project to a local economy. Value added, when calculated for an entire country or region, is known as the gross domestic product or "GDP." This is a common measure of the size of an economy.[7] GDP is the market value of all the goods and services produced by labor and property located in the study area (for this analysis, Oregon and Washington).

[7] The U.S. Bureau of Economic Analysis calculates national and local area GDP data. Some analysts reserve the term GDP for national data and call county-level results the gross regional product or GRP.

Results

The economic impact analysis yields estimates of the total effects on the economy of Oregon and Washington that would result throughout the four years of construction on the JCEP and the PGCP.

Economic Output Impacts

The direct output of the Project represents the gross value of construction work each year on the pipeline and LNG terminal facilities. ECONorthwest was provided monthly spending data for the pipeline and construction site labor by the JCEP. JCEP spending on goods and services, including contingencies, was allocated in proportion to the monthly labor schedule.

Total direct output, shown on Table 4 as a four-year period total, equals $4.494 billion. This was also reported on Table 2 as the portion of total Project expenditures that constitute direct construction impacts.

Table 4: Project construction impacts on economic output in Oregon and Washington, 2014 – 2017, millions of 2011 $

Level of Impact on Economic Output	2014	2015	2016	2017	Four-Year Period Total	Annual Average
Direct	$271.8	$1,283.7	$1,776.0	$1,162.1	$4,493.6	$1,123.4
Indirect	90.2	412.5	465.3	206.0	1,173.9	293.5
Induced	55.7	276.4	403.5	237.9	973.5	243.4
Total Output	$417.6	$1,972.6	$2,644.8	$1,606.0	$6,641.1	$1,660.3

Source: ECONorthwest impact analysis of JCEP and PGCP construction spending, March 2012.

Besides the value of the construction put in place, output would also result from Project spending on goods and services and the spending of employee households. These cause indirect and induced impacts, respectively. In total, the combined gross economic output in the study area would be $6.641 billion.

The net impact of the Project on the GDP of the study area would be less than total output largely because most of the construction inputs would come from sources outside the study area. To account for this, value added was calculated.

Value Added (GDP) Impacts

Value added or GDP is output minus intermediate purchases of goods and services. Intermediate goods and services are the outputs of other industries. By subtracting the values of intermediates from the output of the construction project, the remainder is the amount that the Project's construction work adds to the economy.

In the first year, 2014, the GDP of Oregon and Washington combined would be $85.0 million higher due to the Project's construction. As the pace of construction accelerates, the impact on GDP rises, peaking at $702.6 million in 2016.

Table 5: Project construction impacts on the GDP of Oregon and Washington, 2014 – 2017, millions of 2011 $

Level of Impact on Value Added	2014	2015	2016	2017	Four-Year Period Total	Annual Average
Direct	$26.8	$149.4	$292.1	$271.0	$739.4	$184.8
Indirect	27.9	130.5	177.5	104.1	440.0	110.0
Induced	30.3	152.4	233.0	143.3	559.1	139.8
Total Value Added	$85.0	$432.3	$702.6	$518.5	$1,738.4	$434.6

Source: ECONorthwest impact analysis of JCEP and PGCP construction spending, March 2012.

Construction has a direct impact on the GDP of Oregon and Washington of $739.4 million over the four-year period. Indirect effects contribute another $440.0 million to total GDP and the induced impacts, caused by higher incomes of jobholders and small business owners, add another $559.1 million. The total impact on the study area economy is $1.738 billion in additional GDP.

Labor Impacts

Labor impacts are reported as labor income and jobs. Income includes overtime and benefits, which in the construction trades are substantial. Jobs are measured as a combination of the number of payroll employees and self-employed people engaged in work for twelve months. They include both the employees of the prime contractor and all subcontractors working at the construction site. While it can be part-time work, for construction employment in this study, direct jobs were measured as full-time, 2,080 hours per year.

Table 6: Project construction impacts on labor income and full-year equivalent jobs in Oregon and Washington, 2014 – 2017

Type/Level of Impact	2014	2015	2016	2017	Four-Year Period Total	Annual Average
Labor income, including benefits (million 2011 $):						
Direct	$26.1	$145.8	$288.0	$270.5	$730.4	$182.6
Indirect	17.4	81.8	114.6	68.9	282.7	70.7
Induced	16.8	84.2	127.7	78.2	306.9	76.7
Total Labor Income	$60.3	$311.8	$530.3	$417.6	$1,320.0	$330.0
Jobs (full-year equivalents):						
Direct	246	1,315	2,701	2,812	7,073	1,768
Indirect	400	1,857	2,425	1,438	6,120	1,530
Induced	395	1,991	3,070	1,897	7,353	1,838
Total Jobs	1,040	5,163	8,196	6,146	20,546	5,137

Source: ECONorthwest impact analysis of JCEP and PGCP construction spending, March 2012.

Direct labor income between 2014 and 2017 would total about $730.4 million. Including indirect and induced impacts, total labor income throughout Oregon and Washington would be $1.320 billion higher because of the construction.

The construction of the Project would employ the full-year equivalent of 1,768 workers a year directly. As a result of the construction, there would be another 1,530 and 1,838 jobs a year, indirect and induced, respectively, throughout the study area. The increase in total employment in Oregon and Washington would range from 1,040 in 2014 and peak at 8,196 in 2016. On average, the states would experience 5,137 more jobs per year between 2014 and 2017 and labor income would be $330 million higher.

EXHIBIT V
SOLID WASTE AND WASTEWATER
OAR 345-021-0010(1)(V)

CONTENTS

TABLE

APPENDICES

1.0 INTRODUCTION

OAR 345-021-0010(1)(v). *Information about the applicant's plans to minimize the generation of solid waste and wastewater and to recycle or reuse solid waste and wastewater, providing evidence to support a finding by the Council as required by OAR 345-022-0120.*

Before issuing a site certificate, the Energy Facility Siting Council (EFSC) must determine that the applicant plans to minimize the generation of solid waste and wastewater at the South Dunes Power Plant (SDPP) and its related or supporting facilities and to recycle and reuse wastes as much as reasonably practicable. Furthermore, EFSC must determine that the applicant's plans for storage, transportation, and disposal of wastes are likely to result in minimal adverse impacts on the environment and the area around the proposed energy facility site.

This exhibit identifies the estimated volumes and types of waste that will be produced during construction, operation, and retirement of the SDPP; the structures and systems to handle the wastes; how the applicant will reduce, recycle, and reuse waste; and how the applicant will mitigate adverse impacts. Exhibit O contains information regarding water uses and losses. Exhibit B provides a description of the SDPP; Exhibit C provides a description of the location of the SDPP. Exhibit W provides information on the restoration of the site following retirement of the SDPP.

The SDPP will produce both liquid and solid waste. The construction and retirement phases will produce larger quantities of solid waste than facility operations.

All process wastewater produced during facility operations will be collected and discharged to the Industrial Wastewater Pipeline and the Oregon International Port of Coos Bay's (Port's) ocean outfall line. Similarly, it is anticipated that sanitary wastes will both be treated in an onsite sewage treatment plant and be stored, then transported and treated offsite at the North Bend wastewater treatment plant or other permitted wastewater treatment facility. There will be no land application of wastes, or wastewater evaporation ponds, on the SDPP site.

To minimize waste during operation, the applicant has developed provisions to reduce both wastewaters and solid wastes. Examples include selection of air-cooled condensers (ACCs) and use of electrodionization (EDI). Use of ACCs eliminates steam plumes typically associated with power plants and therefore reduces water consumption as well as the chemicals required for water treatment. EDI was chosen for water treatment, as this technology also removes contaminants using electrolysis processes and reduces the chemical waste volumes typically required during water treatment.

Additional examples of waste minimization measures to be used at the SDPP facility include:

- Establish a waste minimization team during each phase of the Project. This team will assess and prioritize each waste stream based on volume, toxicity, or other criteria, establish source reduction and waste minimization targets, periodically evaluate progress, and develop a schedule for future reviews of the plan;

- Instruct staff during construction, operation, and restoration to promote awareness and housekeeping, which will focus attention on reducing or minimizing creation of wastes and wastewaters, promote material recycling and management, and foster proactive waste management practices;
- Establish a routine inspection and maintenance program which will prevent and minimize releases and require immediate reporting and cleanups, thereby reducing the impact and extent of any spills, as well as production of wastes created during remediation and restoration;
- Implement a facility-wide recycling program for waste paper (e.g., office paper, cardboard, and packaging materials) during construction and operations;
- Request that vendors substitute recyclable packaging materials for equipment and materials brought to the site, whenever possible;
- Monitoring and managing chemical and material inventories so that only the amount of materials required are purchased, thereby reducing costs and eliminating wastes;
- Purchase materials from suppliers that promote recycling or that participate in return programs for products or packaging, as well as those that use materials that can be recycled;
- Use of non-contact stormwater for dust control or irrigaton is under consideration. If practicable, stormwater may be used for site stabilization during construction, operations, or restoration;
- Identify and specify use of less hazardous materials and, whenever possible, substitute those products to reduce or eliminate hazardous waste streams and personnel exposure to toxic or hazardous materials;
- Segregate wastes to promote reclaiming or recycling of used oil, spent solvents, solvent wipes, batteries, paints, catalysts, and other potentially hazardous materials to the extent practicable; and
- Segregate construction, operation, and demolition waste (during site restoration) to maximize efficient resource recovery and reuse of materials such as concrete, asphalt, metal alloys, copper, stainless steel, mild steel, iron, and other materials.

This Exhibit V focuses on waste minimization practices and potential adverse impacts to the environment and the area around the SDPP. Exhibit U contains information regarding potential adverse impacts of solid waste and wastewater to specific public service providers.

2.0 TYPES OF WASTE

OAR 345-021-0010(1)(v)(A). *A description of the major types of solid waste and wastewater that construction, operation and retirement of the facility are likely to generate, including an estimate of the amount of solid waste and wastewater.*

2.1 SOLID WASTE PRODUCED DURING CONSTRUCTION

During SDPP construction, a variety of non-hazardous, inert wastes will be generated. Since few components of the former Weyerhaeuser fiberboard mill site remain, construction wastes will generally be limited to materials delivered to the site to support construction of the SDPP. It is estimated that about five tons per month of solid waste will be produced during construction, which will require approximately 39 months.

Solid waste will consist of domestic refuse, office waste, packaging materials (e.g., pallets, cardboard, packing paper, steel banding), steel cut-offs, and construction materials such as concrete, wood, plastic, glass, erosion control materials, and miscellaneous debris. Materials such as paper (office paper, cardboard, and packaging materials), pallets, other wood, and erosion control materials, metal, plastics, and glass, will be sorted and segregated to promote recycling, thereby eliminating most materials from the waste stream.

Construction wastes will also include oily rags, spent batteries, equipment and vehicle maintenance solvents, oils, and paints that may be more difficult to recycle. Hazardous and non-hazardous chemicals, including those used to clean piping systems and the heat recovery steam generators (HRSGs), will be managed appropriately.

2.2 SOLID WASTE PRODUCED DURING OPERATION

Approximately 10 tons per year of solid waste will be produced at the SDPP during normal operation. Solid waste will include both non-hazardous and hazardous wastes, consisting of office and maintenance waste, packaging wastes (fiberboard, plastic, or metal containers or drums, totes, and bags), empty gas cylinders, and other wastes. Although scrap metals, cardboard and wood packing or pallets will be produced during construction, reduced volumes of such materials will be generated during operation.

Included within the estimate of 10 tons of solid waste per year, the water treatment resins and spent air-quality control catalysts will be produced during routine operations or periodic maintenance. The condensate polishing powdered resin, for example, will require replacement monthly or every two months. Spent resin slurry will be collected in a tank and trucked off-site for processing and disposal at an approved facility. An estimated 1,700 pounds of resin will be disposed of each year. The spent resins are non-hazardous waste and may be disposed at a permitted non-hazardous waste landfill, such as the Dry Creek Landfill, as noted in Exhibit U.

The air-quality control catalysts will use a ceramic substrate matrix, with a metallic oxide supported by the matrix. Based on preliminary information, each HRSG will contain an estimated 10 tons of catalyst, which will require initial replacement after approximately seven to nine years of operation. The reclamation process requires separating the metal oxide from the ceramic matrix to allow recovery of the scrap metal (the ceramic portion is then disposed as a non-hazardous waste). The operator of the Dry Creek Landfill operates both a metals recycling facility and the non-hazardous waste landfill, so this facility or another scrap metal recycler would be selected. Since the scrap metal is recycled, the metal is removed from the waste stream. The spent catalyst would be reclaimed offsite and would not create additional wastewaters.

Hazardous waste could include oily rags, spent batteries, fluorescent lights and equipment, and vehicle maintenance solvents and oils if they are not recycled. During operations, it is likely that the SDPP will be classified as either a Conditionally Exempt Small Quantity Generator (CESQG) or a Small Quantity Generator (SQG). Sites meeting the CESQG status are required to generate less than 220 pounds of hazardous waste per month (approximately one-half a 55-gallon drum) and SQG are restricted to less than 1,000 pounds of hazardous waste each month. The SDPP is expected to produce and recycle “universal wastes,” including batteries, fluorescent lights, and possibly mercury-containing equipment such as thermostats. When handled as “universal wastes” such materials are not “counted” against the waste generation weights used to determine generator status.

2.3 SOLID WASTE PRODUCED BY RETIREMENT

Project retirement and restoration will result in scrap metals, concrete wastes, insulation materials, and any remaining oil, fuel, and cleaners used or removed during dismantling and removal of SDPP components.

Exhibit W provides an estimate of quantities of materials that will be removed from the site during retirement. Based on plants of similar size, 1,000 tons of steel, 6,000 linear feet of piping, 1.3 million linear feet of electrical wiring, and nearly 3 million pounds of equipment will be removed from the SDPP site during restoration. Scrap metals (e.g., copper, steel, piping, and wiring) can be recycled and removed from the waste stream. Approximately 11,000 cubic yards (approximately 22,500 tons) of reinforced concrete and nearly 42,000 square feet of insulation will be removed. The estimated quantity of above ground reinforced concrete that will need to be demolished is nearly 11,000 cubic yards.

The Applicant’s preference is that all demolished concrete will be recycled. Portable equipment to break concrete to the desired size, including reinforced concrete, may be brought to the site to break concrete into recyclable material. Both non-reinforced and reinforced concrete can be recycled and there is equipment that can break concrete whether it is plain, mesh, or continuously reinforced concrete. Concrete has typically been broken into small pieces and used as road base or fill. Concrete pieces, sometimes referred to as “urbanite,” have applications in place of stone pavers. Large blocks of reinforced concrete may be used to stabilize slopes or shorelines. Future recycling opportunities depend entirely upon the local needs for such materials when the site is undergoing demolition, which is not within Applicant’s control.

2.4 WASTEWATER PRODUCED DURING CONSTRUCTION

During construction, wastewater will result from sanitary waste, stormwater that contacts oil or other hydrocarbons, testing and commissioning of water supply systems, hydrostatic testing of tanks, piping and equipment, flushing of pipelines and equipment, washing equipment and vehicles, and washing concrete trucks after delivery of concrete loads. The volume of wastewater produced will vary depending on several factors. The volume of sanitary wastewater is directly related to the number of construction workers; other wastewater volumes will largely be determined by the phase of construction.

Estimated wastewater production is provided in Table V-1 and discussed below. In Table V-1 water volumes shown are wastewaters that will or may be generated during construction. Due to the possibility that the duration of the activities may vary, the volumes of wastewater presented in Table V-1 are an estimate.

- Waters used for dust suppression would evaporate or infiltrate into the soil, and water used as combustion turbine (CT) NOx injection or duct firing would not become wastewaters;

- Water used during site civil construction includes water used in portable coolers and in break rooms, soil compaction, and during the latter stages of construction, for seeding and revegetation, so not all water used would become wastewater;

- Water used to flush and chemically clean piping and equipment would become wastewater, but water used during steam blows may be reused, reducing the fraction that becomes wastewater;

- Some water used in hydrostatic testing of tanks may be reused during testing of a subsequent tank, but most would become wastewater.

Table V-1 Estimated Wastewater Production

Activity	Estimated Total Water Usage (gallons)[1]	Wastewater Production (gallons)
Dust Suppression	1,140,000	0
Site Civil Construction	6,000,000	< 6,000,000
Underground Piping Hydrostatic Testing	750,000	750,000
Water Storage Tank Hydrostatic Testing	2,250,000	< 2,250,000
Above Ground Piping and Equipment Flushing, and Hydrostatic Testing	5,400,000	< 5,400,000
System Flushing	850,000	850,000
Chemical Cleaning and Steam Blows	4,500,000	< 4,500,000
Demineralized water need between first fire and commercial operation		
HRSG Makeup	2,073,600	2,073,600
CT NOx Injection	8,784,000	0

Duct Firing	172,000	0

Note: [1]Estimated total water usage is from Exhibit O (Table O-1).

The following discusses the impact of construction phases on the amount of wastewater produced. Construction phases have generally been broken into three phases: (1) before disturbed soil is stabilized (dust control), (2) construction (pipe and equipment cleaning, hydrostatic testing, etc.), and (3) first fire of the SDPP to operations.

The need for dust control is seasonal, but under windy and dry conditions, the need would be greatest during the initial phases of construction, during and after grading operations, until exposed soil surfaces are stabilized (e.g., by concrete, aggregate, pavement, mulch, vegetation). If capture of stormwater is practicable, it may be used for dust control or as irrigation of new plantings.

The cleaning, flushing, and hydrostatic testing of tanks, piping, equipment and other components would primarily be conducted during the final phases of construction, after components have been assembled and major systems are tested. Demineralized water will be produced during the final phase of construction (for final cleaning and steam blows), and following first fire.

2.5 WASTEWATER PRODUCED DURING OPERATION

During operation, the SDPP will produce wastewater from various sources: sanitary system, HRSG blowdown, demineralized water treatment system (from the reverse osmosis (RO) reject, and pressure filter backwash), combustion turbine washes, plant/equipment/secondary containment drains, RO chemical cleaning, and stormwater. Table V-2 provides estimates of the amount of wastewater produced from each source for annual average conditions during operation. Amounts of wastewater shown in Table V-2 are based on the volumes shown in Exhibit O, Figure O-1, the average day water mass balance. Sanitary wastewater estimates are based on a permanent staff of approximately 45 total, over three shifts a day. Other wastewater estimates are based on the average operating condition of the SDPP; two blocks of combined-cycle generation.

The volume of stormwater will be dependent on weather conditions; however, only stormwater that contacts oil or other hydrocarbons will be disposed as wastewater. Other stormwaters will be infiltrated into the sand backfill or directed to the infiltration pond, vegetated ditches or swales, or biofilters/filter strips to promote retention and infiltration. It is anticipated that sanitary wastewaters will be treated in an onsite wastewater treatment facility and then discharged to the Industrial Wastewater Pipeline and/or stored, transferred and treated at the North Bend wastewater treatment plant or other permitted wastewater treatment facility.

Table V-2 also provides information regarding disposal structures and systems, which are discussed in this exhibit.

Table V-2. Anticipated Wastewater Volumes[1]

Wastewater Source	Avg GPD	Max GPD	Disposal Method
Sanitary System	4320	4320	Portable units during construction; on-site wastewater treatment and disposal to the wastewater sump to the Port line during operation
HRSG Blowdown	84,960	200,640	Wastewater sump to Port line
RO Rejects	175,680	226,080	Wastewater sump to Port line
CT Wash Waters	10,800[2]	10,800[2]	Hauled off-site
Plant/Equipment Drains, Secondary Containments	43,200	43,200	Wastewater sump to Port line
Filter Backwash	34,560	44,640	Wastewater sump to Port line
RO Chemical Cleaning	1,000[3]	1,000[3]	Hauled off-site

[1] Anticipated wastewater volumes are based on two blocks of combine cycle generation. Some waste streams are reused and not part of plant wastewater discharge.
[2] Gallons/Year. Each CTG washed approximately every two months.
[3] Gallons/Year. RO chemical cleaning is approximately once a year.

The primary source of wastewater will be from the reverse osmosis (RO) units in the demineralized water treatment system, used to treat the municipal water supply to create demineralized water. Under average operating conditions, this waste will be approximately 175,680 gallons per day (gpd) to the wastewater collection sump for discharge to the Industrial Wastewater Pipeline. The municipal water will also be treated by pressure filters ahead of the RO units. The filter backwash, estimated at 34,560 gpd (average), will also be routed to the wastewater collection sump for discharge to the Industrial Wastewater Pipeline.

HRSG blowdown is necessary to maintain the required water chemistry in the boiler for proper operation of the boiler and steam turbine. HRSG blowdown is quenched by mixing with municipal water prior to collection in a sump; the resultant wastewater is pumped to the Wastewater Collection Sump for discharge to the Industrial Wastewater Pipeline.

The preliminary estimate for the chemical makeup of the steam generator boiler blowdown provided in Table V-3 represents the wastewater concentrations directly from the drum, prior to the addition of any quench water. The SDPP wastewater sump will also include wastewaters from other components on the SDPP, including the water treatment equipment and the oil/water separators, and the estimated wastewater discharge quality in the wastewater sump is provided in Table V-4.

Table V-3 Estimated Chemical Makeup of Boiler Blowdown

	Normal Operations	Maximum (during start-up)*
Iron	10 to 100 ppb	3 ppm[1]
Ammonia	1 ppb	3.5 ppm[2]
Phosphate	NA	5 ppm[3]

Notes:
[1] The maximum concentration of iron in boiler blowdown if provided; however, the actual concentrations will likely be less.
[2] Ammonia is at pH of 9.2.
[3] Phosphate is fed during start-up and upset conditions only.
*Start-up conditions last from 5 to 12 hours.

Table V-4 Estimated Wastewater Discharge Quality (from the SDPP Wastewater Sump)

	Composition (ppm unless otherwise noted)	
Component/Property	**Average**	**Maximum**
Total Dissolved Solids	250	2,000
Total Suspended Solids	30	100
Aluminum	0.08	0.75
Copper	0.5	3
Fluoride	3	6
Iron	0.9	3
Manganese	0.3	0.5
Oil and Grease	15	20

Notes:
1 Wastewater quality is based upon the raw water data from Coos Bay-North Bend Water Board (Table 2.1-2, "Utility Water Pipeline Condition").
2. Assumed maximum Total Suspended Solids (TSS) in raw water is 10 ppm.

Non-chemical wastes from the treatment of municipal water to produce high purity demineralized water (filter backwash and reverse osmosis reject) are sent to the Wastewater Collection Sump for discharge to the Industrial Wastewater Pipeline. Reject water from the RO process will have an increased dissolved solids concentration but will not contain any added chemicals. Non-chemical wastewater from plant and equipment drains, and secondary containments is also sent to the Wastewater Collection Sump for discharge to the Industrial Wastewater Pipeline. Appendix V-1 is a letter from the International Port of Coos Bay confirming that the Industrial Wastewater Pipeline has sufficient capacity to handle this wastewater.

Most chemicals will be stored within areas that have containment berms. Spills will be collected, treated (neutralization or oil-water separation), tested, and sent to the Industrial Wastewater Line or, if necessary, wastewaters may be transported off-site for processing and disposal at an approved facility. RO chemical cleaning wastewater will also be trucked off-site for processing and disposal at an approved facility if it does not meet the criteria for disposal under the National Pollutant Discharge Elimination System Permit.

To maintain combustion turbine generator (CTG) efficiency, the compressor section of the CTG will be periodically water-washed to remove any fouling of the compressor blades. Off-line or on-line wash waters are collected in a holding tank. The wash water will contain a detergent used to aid in cleaning any substances washed from the compressor blades. The wash water waste will be trucked off-site for processing and disposal at an approved facility. Both the City of Coos Bay and North Bend maintain approved wastewater treatment plants that could accept this wastewater. In addition, PPV Inc., a wastewater treatment firm in Portland, Oregon, has more than adequate capacity to accept JCEP's anticipated wastewater. See Appendix O-5, a service provider letter confirming adequate capacity from PPV Inc.

Stormwater from building roofs and other impervious surfaces within the SDPP will be collected and routed to the stormwater infiltration pond, where it will evaporate or seep into the ground. Any stormwater that could be contaminated with oil will first pass through an oil-water separator to remove the oil or will be contained for testing and sampling before being sent to the collection sump and Industrial Wastewater Pipeline.

Oily wastewater collected from areas where the potential for oil contamination exists will be treated in the oil/water separator. Treated wastewater discharge from the oil/water separator will be sent to the wastewater collection sump for discharge to the Industrial Wastewater Pipeline. Oil removed by the oil/water separator will be retained in the separator for periodic removal and off-site disposal.

2.6 WASTEWATER PRODUCED BY RETIREMENT

Wastewater produced by retirement of the facility will include stormwater contaminated from contact with oils or hydrocarbons, sanitary waste, and wastewater from washing equipment and vehicles.

3.0 DESCRIPTION OF STRUCTURES AND SYSTEMS

OAR 345-021-0010(1)(v)(B). *A description of any structures, systems, and equipment for management and disposal of solid waste, wastewater, and storm water.*

3.1 SOLID WASTES DURING CONSTRUCTION

During construction, solid waste that cannot be recycled will be collected in roll-off bins and transported to an approved landfill. The Dry Creek Landfill in Eagle Point is located approximately 180 miles from the SDPP and this facility or other permitted disposal sites will be used. During construction, workers will keep recyclable material separated from the solid waste stream; recyclable material will be stored, and delivered periodically, by a contractor, to appropriate recycling facilities. It is not expected that any special disposal permits will be required during construction. Generation of construction waste will be minimized through use of detailed estimates of material needed and efficient construction practices, including management of schedules and material inventories and housekeeping practices.

3.2 SOLID WASTES DURING OPERATIONS

During operation, refuse will be collected in a roll-off bin and picked up weekly by a local licensed contractor. Ultimate disposal of normal office and operations and maintenance refuse will take place at the Dry Creek Landfill or another permitted landfill.

Recyclable materials such as office paper, aluminum cans, and plastic materials will be sorted and separated from the solid waste stream following the SDPP waste minimization plan to be developed, as described in OAR 345-021-0010(1)(v). Such materials will be delivered periodically to or picked up by recycling contractors.

Used oil, lead-acid, and nickel-cadmium batteries will be stored in an approved manner and recycled to the extent practicable. Minimum storage requirements for these types of wastes are summarized in Table V-5.

Table V-5 Minimum Storage Requirements

Substance	Regulation	Storage Requirements
Used Oil	40 CFR Part 279	• Store used oil in closed 55-gallon drums or tanks labeled "used oil". • Containers or tanks for used oil must comply with 40 CFR Part 112, and included in the SDPP Construction or Operation Spill Prevention, Control and Countermeasures (SPCC) Plan. • Do not mix used oil with solvents, detergents, antifreeze, or other substances. • Used oil may be burned in an approved onsite space heater with a maximum capacity of less than 0.5 million Btu (British Thermal Units) per hour, provided it is vented outside. • Used oil may be transported offsite by the generator or a licensed transporter, and sent to a used oil processor or re-

Substance	Regulation	Storage Requirements
		refiner meeting the standards of 40 CFR Part 279, Subpart F. • Maintain records of chemical analyses demonstrating no halogens have been added to the used oil, the quantities produced per month, and all offsite shipments. • Immediately clean-up and report any spills or leaks of used oil. Place clean-up materials and soils in approved containers for proper disposal offsite
Spent Batteries	40 CFR Part 273.2 and 273.9 OAR 340-113	• Label each container "Universal Waste-Used Batteries" as well as battery-type. Do not label the containers as "Hazardous Waste". • Include the date waste was first placed in the container. Universal waste must be disposed within 12 months.. • Universal wastes include only batteries that exhibit one or more of the characteristics in 40 CFR Part 261, Subpart C. • Discharge the batteries to remove remaining electrical charges. • Segregate batteries by battery type (e.g., lead-acid, nickel-cadmium, nickel-metal hydride, lithium ion, lithium ion polymer). • Place in closed corrosion-proof containers such as polyethylene tubs or 30-gallon drums. • Lead-acid batteries which are not managed in accordance with 40 CFR Part 266, Subpart G are considered universal wastes. • Retain the certificate or receipt indicating when batteries are recycled.

3.3 SOLID WASTE DURING RESTORATION

To reduce traffic impacts, as well as potential damage to public roadways, the barge berth structure may be the principal means of transport to remove bulk materials such as metals, concrete and equipment from the site during restoration.

Insulation materials will also comprise a large volume of waste produced during restoration of the SDPP site. Other materials produced in significantly smaller volumes will include any remaining oils, fuel, chemicals, and cleaners (water and selected cleaners) used during the final "washdown" of the tanks, piping, and components.

3.4 WASTEWATER AMD STORMWATER DURING CONSTRUCTION

Portable toilets will be used during SDPP construction, and sanitary sewage will be managed and transported to a licensed sewage treatment plant by a contractor. The American National Standards Institute calls for one portable toilet per 10 workers for a 40-hour work week. For a peak construction crew of approximately 500 workers, approximately 50 portable toilets will be required. Two local portable toilet vendors on the Oregon Coast have expressed interest and capability in providing these services. One vendor has its own permitted treatment plant. The City of North Bend has also confirmed that they can accept this waste in a holding tank. The wastewater would be characterized and blended with the regular municipal water steam treated by the North Bend wastewater treatment plant.

Wastewater generated during testing and commissioning of the water supply systems, hydrostatic testing and flushing of the water lines, washing equipment and vehicles, and washing concrete trucks after delivery of concrete loads will be treated as appropriate. Temporary storage tanks such as mobile “frac” tanks may be used during testing and commissioning to store test waters allowing reuse, as well as determination if contaminants are present. Disposal of waters will depend on the presence of contaminants.

- If contaminants are not present, such waters may be allowed to infiltrate into the soil, provided such actions are authorized by Oregon DEQ;
- If contaminants are present, proper management practices would include use of the industrial wastewater pipeline or offsite treatment and disposal.

Onsite treatment will depend upon the contaminants and could include directing the wastewater to an oil/water separator or removal of concrete washout constituents. Wastewater will be collected on the site and treated, if necessary, and either sent to the facility’s sump and the Industrial Wastewater Pipeline, or trucked off-site for processing and disposal at an approved facility. Significant amounts of construction wastewater are not anticipated until the later phases of construction to support commissioning activities when the major collection and treatment systems will be operational.

Hydrostatic test waters that have not contacted oils, detergents, chlorine, or other contaminants, may be stored for reuse in additional hydrostatic tests, or sampled and analyzed to determine if it may be directed to the stormwater infiltration pond, if allowed by the site’s anticipated National Pollutant Discharge Elimination System (NPDES) permit modification.

Stormwater will be managed by first instituting measures that will reduce the potential contact between stormwater and pollutants.

- Stormwater will be diverted around vehicle and equipment maintenance areas where hydrocarbons, including fuel, oils or lubricants, are stored and dispensed;
- A combination of temporary berms, ditches, dikes, or piping and stormwater conveyance channels will be used during construction to reduce contact between stormwater and either disturbed soil and sediment, other pollutants, or sources of hydrocarbons;
- Drains at containment areas where hydrocarbon spills may occur will be kept closed to prevent an inadvertent release of oil-contaminated stormwater.

Stormwater that sheet flows across the site and does not come into contact with pollutants other than sediment, will be infiltrated into the sand, with any remaining stormwater directed to the infiltration basin, vegetated swales, or biofilters, and managed in accordance with the anticipated NPDES Stormwater Discharge General Permit (1200-C). Stormwater that comes into contact, or has the potential to contact hydrocarbons, will be managed as wastewater discussed above, until the oil-water separator is available for use. Once the oil/water separator is available, petroleum-contaminated stormwater will be treated before discharge through the Industrial Wastewater Pipeline.

Areas used for construction equipment, laydown, fabrication, or parking areas will not be lined; however, the following BMPs or others may be used to reduce potential for contact with pollutants, including hydrocarbons, and to manage stormwater from areas where contact is observed:

- Marking of storm drains and catch basins in areas used for construction equipment, laydown, fabrication and parking;
- Covering selected equipment and materials (or specific portions of such equipment, if appropriate) with tarpaulins;
- Using larger containers, such as commercial shipping boxes, to store small equipment, drums, or containers (thereby isolating stormwater from petroleum products);
- Routine inspection of equipment, vehicles, and materials that are exposed to the weather (daily, weekly or monthly, as determined by use or likelihood of leaks or drips) and prompt maintenance of equipment and vehicles to identify and correct drips and leaks;
- Use of fuel containment and/or drip pads when fueling vehicles and equipment;
- Unless an oil/water separator or oil-absorbents have been installed, isolating or sealing storm drains and catch basins to contain sediment as well as hydrocarbon-contaminated stormwater;
- Capture of drips or leaks on oil absorbent pads or absorbent barriers to minimize oil contact with stormwater;
- Inspection or containment areas and documentation of stormwater quality from fueling stations (where incidental fuel spills may be present) prior to necessary action, such as collection of stormwater or its release.

Soiled absorbent pads or barriers will be collected and disposed off-site. Stormwater captured within a containment area (at the fuel storage tank for example) will be inspected for any oil sheen prior to release. Any evidence of a sheen will require collection of the stormwater using a vacuum truck or other means to allow proper off-site disposal or directing the stormwater to an oil/water separator. The Conceptual Stormwater Management Plan in Exhibit I (Appendix I-4) includes additional BMPs.

3.5 WASTEWATER AND STORMWATER DURING OPERATIONS

Structures and systems for wastewater and stormwater disposal include the collection and treatment of selected wastewater streams, biofilters, and the stormwater infiltration pond. The criteria considered in selecting the disposal options included emphasizing re-use of wastewater, and minimizing impacts to Coos Bay water quality. Process wastewaters and contaminated secondary containment waters will be collected, treated (neutralization or oil-water separation) and sent to the Industrial Wastewater Line to a sea outfall. The applicant maintains an NPDES Industrial Wastewater Permit that will be modified to regulate this waste disposal. Non-contact stormwater will be directed to the stormwater infiltration pond.

3.6 SDPP SANITARY WASTE SYSTEM

The volume of sanitary waste to be produced during SDPP operation will be less than during construction (on average waste will be produced by a staff of 45 people per day, compared to 500 construction workers during the peak of construction). During SDPP operation, sanitary waste will be handled in a manner similar to the process described previously during the construction phase. Sanitary wastes will be stored in an onsite wastewater tank and periodically transported to the North Bend wastewater treatment plant by local provider.

4.0 CONSUMPTIVE WATER USE REDUCTION

OAR 345-021-0010(1)(v)(C). *A discussion of any actions or restrictions proposed by the applicant to reduce consumptive water use during construction and operation of the facility.*

Consumptive water uses of SDPP operation include sanitary wastewater discharge to the Industrial Wastewater Pipeline, service water used for general plant maintenance, water injection to the CTs for nitrogen oxide (NO_x) control, and nonrecoverable losses from the HRSG/steam cycle. The applicant proposes to reduce the amount of consumptive water use by re-using condensate provided by the LNG plant and using air-cooled condensers rather than cooling towers or once-through cooling, a significant water-saving measure.

During construction, the Applicant will insist that water conservation methods be used to minimize use. Such methods and measures will include leak detection and repair, recovery and recycling, and use of other best management practices, such as the following:

- Installing air-cooled condensers rather than a cooling tower, significantly reducing make-up water needs as well as consumption of demineralized water.
- Hydrolyzing steam piping to remove millscale before steam blows, to reduce the number of blows and water use.
- Recovering and reusing hydrostatic test and flush waters during construction whenever possible, saving about a third of the water for chemical cleaning.
- Using uncontaminated stormwater for dust control and irrigation.
- Designs that use native plants and low maintenance landscaping.
- Automatic shut-off valves, flow restrictors, and low flow sanitary facilities.
- An inspection and maintenance program, using in-service leak tests to locate and eliminate leaks and water losses from pipes, valves, and connections.

5.0 PLANS FOR RECYCLING AND REUSE

OAR 345-021-0010(1)(v)(D). *The applicant's plans to minimize, recycle or reuse the solid waste and wastewater described in (A).*

5.1 RECYCLING DURING CONSTRUCTION

Recyclable materials will be separated from the solid waste stream produced during construction. Recyclable materials will likely include scrap metals, lumber, batteries, mercury-containing lights, used oil, paper, cardboard, and other packing materials. With the exception of universal wastes (e.g., batteries, mercury-containing lights) which cannot be stored longer than 12 months, recyclable materials will be stored on-site until sufficient quantities exist to make recycling economic, and then sent or sold for recycling. Used oil will be recycled through one of several specialist firms providing this service in the region. Aluminum cans, glass bottles, and office waste paper will be recycled using a local disposal service in the area. The generation of construction wastes will be minimized through the use of detailed estimates of material needs and efficient construction practices. The ability to reuse or recycle wastewater will depend on the chemical characteristics of the wastewater. Non-contaminated wastewater generated from hydrostatic testing or flushing of lines may be collected and used as dust suppression.

5.2 RECYCLING DURING OPERATIONS

Reuse or recycling of many of the wastewater streams listed in Table V-1 is not cost-effective or appropriate without additional treatment. However, reuse of the condensate stream provided by the LNG plant's gas conditioning facility is a substantial reuse of potential wastewater, minimizing the need for steam-cycle demineralizing water.

Recyclable materials will be separated from the solid waste stream, stored, and delivered periodically to a recycling facility. Recyclable materials will likely include aluminum cans, bottles, waste paper, used oil, mercury-containing lamps, and lead-acid and nickel-cadmium batteries. Operation is not expected to produce significant quantities of scrap metal, lumber, or cardboard. The applicant will contract with a firm for recycling its waste oil and lead-acid batteries. Aluminum cans, bottles, and office waste paper will be recycled by a local service.

5.3 RECYCLING DURING RETIREMENT

Wastes produced during retirement will either be disposed of or recycled using approved methods and technologies used at that time and in accordance with a restoration plan approved by Coos County and the Oregon Department of Energy (ODOE).

6.0 POTENTIAL ADVERSE IMPACTS OF WASTE DISPOSAL

OAR 345-021-0010(1)(v)(E). *A description of any adverse impact on surrounding and adjacent areas from the accumulation, storage, disposal, and transportation of solid waste, wastewater and storm water during construction and operation of the facility.*

6.1 IMPACTS DURING CONSTRUCTION

No significant adverse environmental impacts are anticipated from the accumulation, storage, disposal, or transportation of solid waste, wastewaters, or stormwater during construction of the SDPP. Project construction will be in accordance with the site certificate, all permits, conditions of approval, and good engineering and construction practices to ensure that construction activities cause no significant adverse environmental effects on human health, welfare, and the environment.

Stormwater control measures will be installed and maintained to promote infiltration and to prevent potential pollutants from contacting stormwater. During construction, stormwater that has not contacted oil or other pollutants will be infiltrated into the sand backfill and any runoff will not be allowed to discharge directly to waterways without first encountering a variety of erosion and sediment control measures and best management practices (BMPs). Such measures will be implemented to avoid, reduce, or mitigate impacts on surrounding or adjacent lands, and Coos Bay from stormwater. Such measures and BMPs will be established prior to construction in the site Stormwater Management Plan and Erosion and Sediment Control Plan (refer to Exhibit I, Appendix I-4, for conceptual plans). These plans will include such controls and practices as temporary and permanent soil stabilization, use of silt fences, aggregate-protected entrances, dust control, site grading/drainage, revegetation/covering of affected areas, including natural buffer strips between the work areas and Coos Bay, and an inspection and maintenance program.

Sanitary wastewaters from the project construction site (portable toilets) will be trucked to a sewage treatment plant by a licensed contractor for treatment and disposal.

Solid waste that cannot be recycled will be trucked to permitted landfills. The environmental effects of solid waste disposal at properly designed and permitted landfills will be minimal. Trucking waste to landfills during construction will cause a temporary increase in truck traffic; however, because the increase in traffic is temporary and will use existing roads, the impacts are expected to be minimal. The SDPP construction site and ultimately the operational site are expected to be registered by the applicant as a CESQG or a SQG of hazardous wastes, which restricts the storage and accumulation of such wastes on-site.

To assure that wastewater and stormwater are not impacted by oils stored and used onsite during construction, the main construction contractor will be expected to develop and implement a Spill Prevention, Control, and Countermeasure (SPCC) Plan during construction activities. The SPCC Plan will describe the layout of the SDPP during construction, including the locations, contents, and volumes of all fixed oil storage containers, as well as areas where mobile or portable containers and transfer stations and connecting pipes are located. The SPCC Plan will also include discharge prevention measures and procedures for routine handling and transfer of oil, to minimize the potential for oil spills and contact with either wastewaters or stormwater. Containment measures, as well as countermeasures and proper disposal planning for any oil-contaminated wastewater and any stormwater found in containment areas, are also required in the SPCC Plan.

Process wastewaters produced during the latter stages of construction and pre-operational testing will be collected and discharged to the Industrial Wastewater Line and will have no impact on surrounding or adjacent areas.

6.2 IMPACTS DURING OPERATION

No significant adverse environmental impacts are anticipated from accumulation, temporary storage, disposal, or transportation of solid waste, wastewaters, or stormwater during operation of the SDPP. Project design, maintenance, and operation will be in accordance with the site certificate, all permits, conditions of approval, and engineering and operating practices to ensure that the power plant will have no significant adverse environmental effects on human health, welfare and the environment.

Adverse impacts could occur as a result of stormwater runoff from the project site; however, stormwater runoff will be managed by both temporary and permanent measures that prevent or minimize the potential for pollutant contact with stormwater, and facility design measures that capture pollutants prior to infiltration, preventing discharge to Coos Bay. The temporary pollution and sediment control measures installed during the construction phase will be maintained as necessary, until satisfactory vegetative cover is restored or permanent stabilization and control measures are complete.

Contact stormwaters will be collected, directed through an oil-water separator or treated, and discharged to the Industrial Wastewater Line. Non-contact stormwaters will be directed to vegetated swales, biofilters, or the stormwater infiltration pond, where they will be allowed to seep into the soil or evaporate. Stormwater control measures and best management practices to avoid, reduce, or mitigate impacts on surrounding or adjacent lands will be implemented during operation in accordance with a post-construction SWPP Plan that will be prepared for the operation of this industrial facility.

Sanitary wastewaters from project operations will be treated in an onsite sanitary wastewater treatment plant and discharged through the Industrial Wastewater Pipeline or held and transferred for treatment offsite. Sanitary waste disposal is expected to have no adverse impacts on surrounding or adjacent areas or groundwater quality.

Non-hazardous solid waste that cannot be recycled will be collected and trucked to approved landfills by a licensed contractor. The environmental effects of solid waste disposal at a properly designed and permitted landfill will be minimal. Pick-up and trucking waste to the landfill during operation (likely on a weekly basis) will not cause a noticeable increase in truck traffic as demonstrated in the Traffic Impact Analysis attached to Exhibit U.

During operations, the site is expected to be registered and managed by the applicant as a CESQ or SQG of hazardous wastes, which restricts the storage and accumulation of such wastes on-site. The applicant will also develop and implement an SPCC Plan for operations, minimizing the potential for oil spills.

Process wastewaters will be treated, collected, and discharged to the Industrial Wastewater Line in accordance with the Pretreatment Agreement, and will have no impact on surrounding or adjacent areas.

7.0 MINIMIZATION OF ADVERSE IMPACTS OF WASTE DISPOSAL

OAR 345-021-0010(1)(v)(F). *Evidence that adverse impacts described in (D) are likely to be minimal, taking into account any measures the applicant proposes to avoid, reduce, or otherwise mitigate the impacts.*

Plans to be developed include: a Waste Minimization Plan (WMP), Spill Prevention, Control and Countermeasures (SPCC) Plans (for construction and operations), a Site Restoration Plan (SRP), Stormwater Management Plan (SWP), and Stormwater Erosion & Sediment Control Plan (ESCP). These plans will be developed to comply with applicable requirements as well as minimize adverse impacts as follows:

Waste Minimization Plan

Section 15 of the Uniform Hazardous Waste Manifest (an Appendix to 40 CFR Part 262) requires hazardous waste generators to certify they comply with waste minimization practices (40 CFR 262.27). Small quantity generators (SQG) are required in 40 CFR 262.27(b) to certify that they have made a good faith effort to minimize waste generation and that they have selected the best waste management method that is available and affordable. While the regulations define neither a “good faith effort” nor what “best waste management method” may apply, a WMP will be prepared for the SDPP to document such a “good faith effort” has been made to minimize both the volume and toxicity of any hazardous wastes generated at the SDPP.

The WMP will focus on identifying and prioritizing waste streams based on their volume, toxicity, or other criteria, setting source reduction and recycling targets to minimize waste creation, periodically evaluating site-wide progress in meeting those targets, and evaluating how the WMP should be revised so that additional goals achieved. While hazardous waste generators are required to certify that they have a WMP, the facility’s WMP will also establish targets for minimization of non-hazardous wastes.

Spill Prevention, Control, and Countermeasures Plan

Regulations requiring a Spill Prevention, Control, and Countermeasures (SPCC) Plan were promulgated under Section 311(j) of the Clean Water Act and amended by the Oil Pollution Act of 1990. A site-wide SPCC Plan is required for the SDPP based on the volume of oil stored at the facility as well as the potential for a release of oil to affect a navigable water. The SPCC Plan (revised as necessary during the construction, operation, and likely the retirement and restoration phases) will identify the quantity and types of oils stored on the site in equipment, containers or tanks that are 55-gallons in size or greater, the locations and general design of each storage area, the flow paths for spills, procedures to prevent oil spills, measures to contain and address any spills (including external containment areas that could capture any spill), personnel responsible for managing and reporting spills, and response to any spill. Such plans reduce the potential opportunities for oils stored onsite to be spilled and discharged to Coos Bay, either directly or through contact with stormwater.

Site Restoration Plan

A Site Restoration Plan will be prepared prior to retirement of the SDPP as required by Oregon Administrative Rules (OAR) 345-022-0050. The Plan will include the proposed measures to restore the SDPP site to a useful, non-hazardous condition following permanent cessation of operation. Since retirement of the SDPP is not expected to occur until at least 30 years of operation, an outline of the plan is included in Exhibit W, as Appendix W-1.

The SRP will be approved by Coos County and the ODOE. This Plan will promote planning the orderly demolition of the SDPP, require proper closure of the site, implement reuse of materials and minimize transportation impacts during closure to the extent practicable, and include stabilization of the site to protect Coos Bay. Ultimately, the SRP will also promote future use of this site following removal of the SDPP.

Stormwater Management Plan

Section 401 of the Clean Water Act requires that projects requiring federal permits comply with the State water quality standards. Due to dredge or fill of jurisdictional wetlands, the SDPP requires a US Army Corps of Engineers Permit under Section 404 of the CWA, necessitating issuance of a Water Quality Certification by the Oregon DEQ.

A SWP is required to identify measures to protect water quality and would include best management practices (BMPs) to control discharges of stormwater. The Plan will include detailed inspection and education requirements and maintenance provisions designed to assure pollution control measures perform as desired and minimize stormwater impacts to Coos Bay. Both the anticipated pollutants (e.g., litter and sanitary wastes, oils, solvents and fluids from vehicle and equipment maintenance activities, paints, concrete washout wastes) and measures that would minimize pollution are included in this Plan. Exhibit I, Appendix I-4, has a conceptual Stormwater Management Plan.

Stormwater Erosion and Sediment Control Plan (ESCP)

Discharges of stormwater to Coos Bay are regulated under the Clean Water Act and require a permit under the National Pollution Discharge Elimination System (NPDES), which has been delegated to the Oregon DEQ through associated Oregon laws and regulations. Preparation of an ESCP is required by the NPDES 1200-C Permit, and a Conceptual ESCP is included in Exhibit I, as Appendix I-4.

8.0 PROPOSED MONITORING PROGRAM

OAR 345-021-0010(1)(v)(G). *The applicant's proposed monitoring program, if any, for minimization of solid waste and wastewater impacts.*

As discussed throughout this exhibit, the potential impacts from solid waste and wastewater will be minimized throughout each phase of the SDPP. Solid waste (both hazardous and non-hazardous) and wastewater management practices will be monitored by health and safety and operations professionals to establish waste and wastewater minimization goals and evaluate the progress on meeting those goals.

The discharge of process wastewater to the Industrial Wastewater Line will be monitored in accordance with NPDES Industrial Wastewater Permit.

As discussed in Section 7.0, the site will also have a SMP, ESCP and SPCC Plan in effect during the construction and operation of the SDPP, each of which has self-monitoring requirements. For example, ESCP require identification of designated qualified personnel responsible for inspections, development of an inspection schedule, recording inspection results and corrective maintenance of erosion and sediment control practices installed at the SDPP during construction and operations, as well as monitoring discharges.

Disposal of solid waste (both hazardous and non-hazardous) from the facility will be at permitted facilities; therefore, the monitoring program will be limited to assuring that solid waste is properly packaged and managed during accumulation while awaiting transportation to the selected disposal sites.

The storage and management of hazardous materials and wastes will be in accordance with a wide array of requirements, including building and fire codes, as well as federal and state regulations. The onsite management of hazardous wastes is subject to state regulations (OAR 340-100 to 340-143) and offsite shipment of hazardous wastes must comply with both EPA hazardous waste and United States Department of Transportation hazardous materials regulations.

In the broadest sense, monitoring also includes establishing programs and procedures that assure training, recordkeeping and reporting comply with applicable requirements.

APPENDIX V-1

Industrial Wastewater Capacity Letter from the Oregon International Port of Coos Bay

OREGON INTERNATIONAL
Port of Coos Bay

August 6, 2013

Robert L. Braddock
Project Manager
Jordan Cove Energy Project L.P.
125 Central Ave., Suite #380
Coos Bay, OR 97420

Re: Industrial Wastewater Pipeline Capacity

Dear Mr. Braddock

This letter is to provide you with confirmation that the Industrial Wastewater Pipeline (IWP) as currently installed and operating has an estimated carrying and outfall capacity of between 3.6 to 4.0 million gallons per day. A daily flow ranging from 2.5 to 3.5 million gallons per day was routinely handled when the Weyerhaeuser Paper Mill was in operation. Currently the only input to the IWP originates from the former Weyerhaeuser Paper Mill site where landfill leachate from Cell #3 is collected and discharged into the IWP. While the quantity of leachate is quite small, raw water is purchased from the Coos Bay North Bend Water Board to supplement this leachate to increase the flow to a nominal rate of 400,000 gallons per day. A minimum flow of approximately 400,000 gallons per day is required in order to keep the spargers in the ocean outfall from sanding up.

The proposed average discharge volume of 500,000 gallons per day from the Jordan Cove/ South Dunes Power Plant project is well within the capacity of the IWP and would eliminate the need to purchase water strictly for the purpose of keeping the outfall spargers open and clear of sand.

Sincerely,

David Koch
Executive Director
Oregon International Port of Coos Bay

125 West Central Avenue, Suite 300 / P.O. Box 1215 / Coos Bay, Oregon 97420-0311
Phone: 541 267-7678 / Fax: 541 269-1475 / email: portcoos@portofcoosbay.com / Web: www.portofcoosbay.com

EXHIBIT W
SITE RESTORATION
OAR 345-021-0010(1)(W)

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APPENDICES

1.0 INTRODUCTION

OAR 345-021-0010(1)(w). *Information about site restoration, providing evidence to support a finding by the Council as required by OAR 345-022-0050(1).*

This exhibit provides information about restoration of the site following retirement of the proposed 420-megawatt (MW) natural-gas-fired South Dunes Power Plant (SDPP). Under Oregon Administrative Rules (OAR) 345-022-0050(1), before the Oregon Department of Energy (ODOE) will approve the SDPP, the Energy Facility Siting Council (Council) must find that the SDPP site can be restored adequately to a useful, non-hazardous condition following permanent cessation of construction or operation of the SDPP facility. Council must also determine whether the applicant has a reasonable likelihood of obtaining a bond or letter of credit in a form and amount satisfactory to ODOE to restore the site to a useful, non-hazardous condition. This exhibit describes the expected operating life of the proposed energy facility and how the site would be restored at the end of its useful life, and indicates that a Site Restoration Plan (Plan) would be prepared and approval sought from Coos County when it is determined that the Power Plant would be retired. Appendix W-1 provides an outline of a Plan; however, this information is provided for information only. A cost estimate for site restoration has been provided in Table W-1, with additional details in Appendix W-2.

While the site is currently zoned as industrial and leaving some buildings, utilities and the parking areas may remain if the approved Plan allows, our estimate includes removal of the structures, facilities and utilities provided to support the SDPP. Although leaving such components may encourage development of the site by either a future site owner or Coos County, the Applicant has been advised by ODOE staff that returning the site to a "non-hazardous condition" means removal of all structures, facilities and components built to support the SDPP. This exhibit also discusses monitoring of the site for potential site contamination by hazardous materials.

For the purposes of this Exhibit W, the useful life of the proposed SDPP energy facility is estimated at 30 years. At the end of its useful life, the facility would be retired and the site restored to a useful, non-hazardous condition in accordance with the Coos County-approved restoration plan.

2.0 USEFUL LIFE

OAR 345-021-0010(1)(w)(A). *The estimated useful life of the proposed facility*.

Jordon Cove Energy Project, L.P. (JCEP) would operate the SDPP for as long as the Liquefied Natural Gas (LNG) Plant is operational, or a power purchase agreement is in effect. While the estimated useful life of the proposed facility is 30 years, similar facilities have operated over periods of 40 or more years, with appropriate maintenance, replacements, and upgrades to meet operational and environmental requirements. When it is determined that there will be no future LNG or power market for the electrical energy produced by the facility, the applicant will implement the site restoration plan as appropriate for the intended use of the site and then-current technology. The restoration plan will outline how the facility would be retired and the site restored to a useful, non-hazardous condition.

3.0 RETIREMENT AND SITE RESTORATION

OAR 345-021-0010(1)(w)(B). *Specific actions and tasks to restore the site to a useful, non-hazardous condition.*

When the decision is made to retire the SDPP, the site would be restored to a useful, non-hazardous condition in accordance with the restoration plan. The applicant believes that a useful, non-hazardous condition would be a condition consistent with the applicable local comprehensive land-use plan and land-use regulations at the time of site closure. At least two years prior to the date on which the applicant expects to permanently shut down the SDPP facility, and following consultation with Coos County, the applicant will develop a restoration plan in substantial accordance with OAR 345-027-0110 and submit the plan to Coos County and ODOE for review and approval.

The SDPP and the transmission line are planned for an area currently zoned industrial by Coos County. Site restoration would be conducted in compliance with conditions in the approved restoration plan and in compliance with all contemporary laws and regulations in effect at the time of retirement.

Once approvals have been obtained, the following retirement and restoration activities are assumed to take place:

- When it is determined that the SDPP will be retired, plans will be made to reduce to the maximum extent practicable chemicals, fuels, oils and other materials while the facility is in operation;
- To promote reuse and recycling of demolition materials, opportunities to recycle concrete and other materials to be produced during demolition and site restoration may be reviewed with local communities prior to demolition;
- Prior to any demolition, containers, tanks, equipment and the associated piping will be examined and the necessary steps implemented to use, recycle, neutralize, and remove the contents of such containers, tanks or equipment and to avoid or mitigate any spills or releases during closure;
- Cleaners (whether water or other appropriate cleaners) and any residues will be stored in appropriate containers or tanks. Such materials will be tested to determine proper disposal requirements, safely managed during accumulation, and disposed offsite in accordance with the applicable state and federal requirements;
- Site inspections will be conducted prior to and during demolition for any evidence of staining, odors, or other evidence of spills or releases. Testing will be conducted, as

appropriate, during demolition and prior to site restoration to determine whether soils have been contaminated;

- Should evidence of contamination (e.g., from chemicals, oil or other contaminants) be detected, the extent of soil contamination will be determined and contaminated soil and other investigation or clean-up wastes will be characterized, containerized and disposed offsite, as described in Exhibit V;
- Dismantling and removal of the power generation and associated equipment, including the boiler and associated water and steam piping, pumps, tanks and valves; the steam turbine generator; air pollution control equipment; electrical equipment; switchgear; transformers; and wiring;
- Demolition and removal of the facility buildings and structures, including the stack, tanks and support structures, fencing, and subgrade structures;
- Contents of subsurface pipelines, including the natural gas, water, and wastewater lines, will be purged and the lines cleaned during retirement of the SDPP. Any wastes produced during retirement of the underground piping will be collected, sampled and analyzed (as described elsewhere in this exhibit), and properly disposed offsite. Following cleaning, the pipelines will be removed;
- Removal of storage tanks and pavement;
- Tilling of areas to loosen compacted soil, addition of topsoil, and seeding of native grasses;
- Maintenance of revegetated areas until satisfactory regrowth to ensure minimum erosion from the site.

4.0 ESTIMATED COST OF RESTORATION

OAR 345-021-0010(1)(w)(C). *An estimate, in current dollars, of the total and unit costs of restoring the site to a useful, non-hazardous condition.*

Table W-1 provides an estimate of the costs of restoring the site to a useful, non-hazardous condition. The estimate is described in OAR 345-021-0010(1)(w)(B), and additional information is provided in Appendix W-2. Table W-1 and Appendix W-2 present the format provided by the Oregon Department of Energy for ease of review; however, estimates were prepared using the Black & Veatch's standard estimating process.

5.0 METHODS AND ASSUMPTIONS USED FOR THE ESTIMATES

OAR 345-021-0010(1)(w)(D). *A discussion and justification of the methods and assumptions used to estimate site restoration costs.*

The estimated cost of site restoration will depend on the nature of the then-current zoning regulations and the approved restoration plan. The applicant herein has provided retirement cost estimates and funding surety that are consistent with the State's requirement for energy facilities. The cost estimate was prepared based on comparison with similar-sized units.

The cost estimates address restoring the SDPP site and associated facilities. The scope of the demolition is based on order-of-magnitude quantities, using historical data from similar facilities to estimate installed quantities where applicable and demolition and decommissioning experience. Potential cost estimate assumptions are presented below.

5.1 GENERAL ASSUMPTIONS

- The power plant consists of two power blocks, each consisting of three gas-fired combustion turbine generators, three heat recovery steam generators (HRSGs), and one steam turbine generator, as well as supporting auxiliaries, common facilities, and equipment;
- In general, the estimate is prepared using current unit rates in the spreadsheets, including quantities for Permits, Mobilization, Engineering, Project Overhead, Hazardous Materials inspections, Protection, and Load and Haul, which will reflect then-current year pricing. The total value, excluding performance bond allowance, will be escalated to demolition/restoration-year pricing using the U.S. Gross Domestic Product Implicit Price Deflator, Chain-Weight, as published in the Oregon Department of Administrative Services' "Oregon Economic and Revenue Forecast." The factor can be adjusted, as required.
- The estimate assumes non-selective demolition;
- Estimate does not include salvage of any equipment for resale or storage for resale;
- The scope of the plant demolition is limited to the plant site and does not include any other off-site facilities;
- The estimate is based on plant descriptions and factored historical data from power plants of similar configurations;
- Removal of the selective catalytic reduction (SCR); catalyst unit prices will be developed based on discussions with an experienced demolition contractor;

- Service water facilities and water storage tanks may be left in place to provide for future industrial use and for emergency fire response, because the site is in an industrial zone;
- The cost for waste removal is included in the unit pricing rates;
- The cost estimate assumes that the power block and building foundations will be removed;
- The estimate assumes that all concrete will be pulverized and recycled on site. However, as described previously in this exhibit, opportunities for offsite recycling will be pursued prior to demolition;
- All utilities located 3 feet or more below grade, including but not limited to duct banks, drainage, service and make-up water, fire protection, grounding grid, and other electrical systems, will be removed;
- The estimate does not include preparation/preventive maintenance for utilities. Routine inspection and maintenance will be conducted during operation of the SDPP, and the utilities will be inspected and purged prior to removal during site restoration;[1]
- Estimates assume all filled areas of the facility remain in their current elevated conditions.

5.2 DIRECT COST ASSUMPTIONS

- The cost estimate is based on the premise that work will be performed by a general demolition contractor on a conventional basis rather than an engineering, procuring, and construction contract basis. Costs associated with equipment rental, demolition, and all contractor services are included in the unit pricing rates;
- Estimates do not include Owner's costs (range could be 15% to 25%). These costs vary based on several factors, including, for example, whether the owner prefers to have additional equipment or spare parts associated with the key components (e.g., the air quality control system, steam turbines, boiler) to expedite maintenance, consumables (including fuel) that may remain, tools, rolling stock, and any funds set aside for training, contingency, and the like;
- Scrap pricing or credit is not included based on current ruling from Oregon Energy Facility Siting Council (EFSC);
- Estimate assumes no lead paint, asbestos, or other hazardous materials;
- Costs are "overnight"/present day 2nd Qtr 2014 dollars;

[1] Separate estimates for preparation and preventive maintenance for subsurface utilities (e.g., natural gas, water, and wastewater pipelines) and restoration of the site were not prepared, because such activities were already included during operations and retirement.

- Costs for disposal of waste/architectural debris and preparation of scrap for recycling are included.

The SDPP will employ General Electric LM6000 SPRINT™[2] steam turbine/generator sets. As of this date, there has not been an LM6000 SPRINT™ turbine/generator constructed at other sites. The decommissioning estimate draws from previous design and construction experience with projects using industry standards and Black & Veatch engineering and standard designs. Information from other electric generating stations were used as the basis of this estimate, and includes LM6000 units, which were introduced by General Electric in 1992.

When compared to the LM6000, the LM6000 SPRINT™ unit incorporates design changes that lengthen the footprint of the unit by three feet. Additional piping and equipment components, as well as concrete to support the larger footprint of the unit, increase the estimated volume and weight of the equipment in the LM6000 SPRINT™ configuration as well as resulting demolition, and were included in the estimated quantities produced during demolition and disposal.

[2] SPRINT is a General Electric registered trademark. SPRINT refers to a version of the LM6000 unit equipped with a Spray Inter-cooled Turbine which uses water injection to increase efficiency of the turbine.

Table W-1. Facilities referenced in the development of the SDPP site restoration cost estimate

Reference Plant *(ii)*	Location	Estimate Date	No. of Units	(*i*) Nameplate MW (Max) (i)	Fuel Type	Estimate Costs ($MM)	Comments
Baxter Wilson Units 1 and 2.	Mississippi	2013	2	1,321	Gas/Oil	$40.9	In service
Independence Units 1 and 2.	Mississippi	2013	2(1)	1800	Coal	$29.4	In service
Delta Units 1 and 2.	Mississippi	2013	2	207	Gas/Oil	$15.4	
Gerald Andrus Unit 1.	Mississippi	2013	1	761	Oil/Gas	$22.2	In service
Natchez Unit 1.	Mississippi	2013	1	73	Gas/Oil	$12.0	In service
Rex Brown Units 1, 3, 4 and 5.	Mississippi	2013	4	393.5	Gas/Oil	$21.0	In service, Units 1, 3, and 4 use oil; Unit 5 is a 10MW gas turbine.
White Bluff Units 1 and 2.	Arkansas	2012	2	1,800	Coal	$43.0	In service
Independence Units 1.	Arkansas	2012	1	900	Coal	$22.2	A two unit site, one unit was demolished.
Couch Units 1 and 2.	Arkansas	2012	2	190	Gas/Oil	$11.3	In service
Lake Catherine Units 1, 2, 3, and 4.	Arkansas	2012	4	746	Gas/Oil	$26.8	In service, currently all fuel is natural gas.
Lynch Units 2 and 3.	Arkansas	2012	4(2)	265	Gas/Oil	$14.1	Unit 2 closed; Unit 3 uses natural gas as primary fuel; includes two internal combustion engines.

Reference Plant *(ii)*	**Location**	**Estimate Date**	**No. of Units**	**(*i*) Nameplate MW (Max) (i)**	**Fuel Type**	**Estimate Costs ($MM)**	**Comments**
Moses Units 1 and 2.	Arkansas	2012	2	138	Gas/Oil	$9.0	In service
Ritchie Units 1 and 3.	Arkansas	2012	1	380	Gas/Oil	$12.5	Unit 1 inactive since 2008, Unit 2 demolished 2014; Unit 3 is an active gas combustion turbine.

Notes:

(*i*) Generator Nameplate Rating

(*ii*) Black & Veatch utilized its experience in the design of power plants and the preparation of decommissioning cost estimates in conjunction with the reference plants to establish the estimating approach for the SDPP Decommissioning Estimate.

(1) Includes all dismantling costs and complete removal

(2) These are estimated costs only. Actual bid pricing for the above projects were received from independent demolition contractors and executed by the client. Actual demolition costs are unavailable.

(3) Equipment salvage rights were retained by the dismantlement/demolition contractors. Salvage credits are not included in the above estimate costs

Table W-1 provides additional details regarding the size and nature of the power plants used to produce the cost estimate. Information from these power plants was used as scope reference points for similar items such as: concrete, steel, and piping. Black & Veatch was tasked to estimate demolition of the units listed in Table W-1, but did not execute these demolition contracts, consequently the actual demolition costs are unknown. As noted in the table, the final demolition cost reports may differ from the initial estimates and have not been provided to Black & Veatch. Reasons for differences between estimated and actual demolition costs include, but are not limited to, the value of any equipment and metal salvaged during demolition, since equipment and materials may be retained by the dismantlement and demolition contractors.

As Table W-1 shows, most of the units remain in service. The demolition estimates prepared by black & Veatch may have been used for other purposes, such as long term operating or management decisions, assessing maintenance or facility improvements, securing additional financing, sale of the units, or other actions, rather than immediate demolition.

Site-specific conditions that affect designs include local geology. While differences in geology between the SDPP site and the various sites above were not evaluated, such differences primarily affect foundation design. Differences in site geology could affect small block foundations, such as pipe rack foundations, more than large block foundations (e.g., the combustion turbine, HRSG). Small block foundations in poor soil (loose, unstable soils) may require piles to compensate for poor soil. Large block foundations in poor soil may also require more concrete or differences in design, resulting in a variance of 2 to 5 percent.

6.0 MONITORING PLAN

OAR 345-021-0010(1)(w)(E). *For facilities that might produce site contamination by hazardous materials, a proposed monitoring plan, such as periodic environmental site assessment and reporting, or an explanation why a monitoring plan is unnecessary.*

Although hazardous materials would be stored and used at the SDPP site during operation, the SDPP will be designed to minimize the risk of site contamination by having secondary containment areas and appropriately storing and disposing of wastes. (See Appendix I-4 Erosion and Sediment Control Plan, Section 6 Best Management Practices.) Such hazardous materials include but are not limited to: waste oils, batteries, solvents, and chemicals used during normal maintenance activities or to clean piping and the HRSGs. Hazardous wastes will be disposed of through an appropriate waste disposal service provider.

The applicant does not propose an additional monitoring plan because there are existing monitoring plans which monitor hazardous waste including: the National Pollutant Discharge Elimination System (NPDES) Industrial Wastewater Permit, the 1200-C Erosion and Sediment Control Plan, a Storm Water Pollution Prevention Plan (SWPP), and a Spill Prevention, Control, and Countermeasure (SPCC) Plan. (See Exhibit V, Section 8, Proposed Monitoring Program.) The applicant will comply with these plans which serve to ensure that hazardous materials will not cause site contamination because hazardous materials will be used and stored in accordance with regulations designed to prevent release of hazardous materials.

During operations, any spills or releases of materials would be contained, cleaned-up and reported, as appropriate. The media at the site of the release would also be sampled and analyzed in accordance with the chemical-specific testing protocol described in the Oregon- and EPA-approved methods described in EPA's solid waste (SW) publication, "Test Methods for Evaluating Solid Waste" (SW-846). Impacted media would be containerized and disposed at an approved offsite location.

During retirement and prior to disassembly of components and restoration of the site, chemicals would be consumed (or containers, tanks, and piping emptied and contents properly disposed) to the extent practicable. Any residuals produced during cleaning of equipment, tanks, and piping during closure, will be managed in accordance with applicable requirements. Sampling and testing of wastes and potentially contaminated environmental media, will be conducted as described in the previous paragraph.

APPENDIX W-1

Example Site Restoration Plan

Project Pre- Retirement Phase

1. Two years prior to retirement of the SDPP, the Owner would review the proposed retirement program and preliminary schedule with Coos County and the Oregon Department of Energy (ODOE).
2. Opportunities for reuse of materials to be produced during demolition, including metallic materials (e.g., aluminum, copper, steel, stainless steel) and other materials such as gravel, asphalt and concrete will be investigated with Coos County, local communities and others.
3. Key restoration issues to be considered will include review of the beneficial reuse of the site as an industrial-zoned site, and consistent with any planned uses described in the Coos County Master or Comprehensive Plan.
4. Future use of the site will be reviewed with the County and an assessment of the utilities on the site will be provided to the County.
5. An estimate of the chemicals and other materials in the plant inventory will be compared against operational requirements.
6. Pre-retirement planning, transportation route planning, and schedules for removal of any excess equipment or materials will be established.
7. The condition of the SDPP substation will be evaluated to determine if sale of the substation or components to the utility is desirable. If components of the substation, overhead power lines, or other materials can be used by the utility, agreements to sell such materials will be negotiated.
8. The Subcontractors for site closure (demolition) and restoration will be awarded.
9. The condition of the barge facility, onsite/off-site roadways and staging areas, and adequacy of storm water protection measures will be assessed and determination made regarding repairs or enhancement of the facility to support site closure.
10. Determination of suitable off-site sources for topsoil, revegetation planning, appropriate seed mixes for native plant species,
11. Determine the site-specific requirements and techniques in current use (time of site closure), current state-of-the-industry at the time the SDPP is to be closed as well as the performance criteria and post-closure monitoring plan to assess the adequacy/success of final closure.

Site Closure Requirements
The following activities will be performed during closure of the SDPP site:

1. Preparation of the final site sampling and quality assurance plan, as well as measures to protect Coos Bay. The plan would specify the parameters to be tested and the testing necessary, and would include sampling of residuals in tanks, containers, and piping, as well as soil or other environmental media.
2. Determination of any materials to be removed from the site to estimate quantities and assure personnel safety,
3. Pre-removal planning, including staging of removal equipment, including roll-off boxes, tanks and containers, and barge or truck transport options.
4. Survey of the site (not limited to chemicals remaining, identification of contaminants, and review of historical records of spills and prior remedial actions), including a site inspection to determine and record the location, quantity and nature of materials at the site.
5. Removal of any remaining chemicals, hazardous materials, and equipment from the site.

6. Staging and removal of equipment, structures, scrap metals, concrete, insulation, and other components.
7. Characterization of the existing site conditions, topography (current and final), watershed and outfall evaluation.

Site Restoration Phase
The restoration components of the plan will include:

1. Removal of remaining equipment, structures, foundations and testing of media to assess contaminant levels.
2. Development of the stabilization sequence, staging erosion control materials, topsoil, seed mix, buffer plants, mulches, and other components;
3. Grading and planting of suitable rapid-growth grasses or plants to discourage the spread of invasive exotic plants, including application of herbicides by licensed applicators, as approved.
4. Planting according to the approved plan and preparation of an 'as-built' report.
5. Inspection of the site in accordance with the permitting schedule and maintenance of the erosion control and stabilization measures until satisfactory cover has been re-established,
6. Submittal of the Notice of Termination.
7. Annual post-closure monitoring to assess planting success and control of invasive species for the approved period.

APPENDIX W-2

Estimating Process and Details

South Dunes Power Plant (SDPP) Decommissioning

Decommissioning Estimate Narrative

Overview

The overview is intended to provide the estimate approach taken as scope, viewed currently, and a perception of project execution.

The estimate is preliminary in nature, that is, the accuracy range of the estimate is viewed as a probability of minus thirty percent (-30% cost under run) to plus thirty percent (+30% over run).

The estimate includes the SDPP power generation facility and shared common facilities that the SDPP is connected to or jointly uses. Facilities adjacent to the SDPP such as the Gas Conditioning Facility, the Pacific Power Substation, Pacific Connector Gas Metering Area and the Southwest Oregon Resource Security Center (SORC) are excluded from the estimate scope. All other above ground and below ground structures are included in the decommissioning estimate, along with any hazardous chemicals and wastes.

Following demolition, the areas to be restored will include areas formerly occupied by the structures and components described in Section 2 of Exhibit B (i.e., combustion turbine generators, heat recovery steam generators (HRSGs), air-cooled condensers, switchyard, transmission lines, water system components, roads and parking areas, gas pipeline, buildings, storm water infiltration pond, fuel tank, water and wastewater treatment facilities, and security features, such as fencing, lighting, and guard facilities). Portions of the haul road will continue to be used by Roseburg Forest Products, and the Pacific Power substation will remain for their use, so the estimate does not include removal and restoration of these components.

The estimate ultimately reflects a future site that after 30 to 40 years use is level, top dressed with clean soil and seeded with native grass species.

Scope

Demolition will be conducted as to limit the disruptive effects to the surrounding area. Explosives are not perceived in the estimate. Soil migration from the site will be managed with appropriate control methods until vegetation is established.

Costs for repair and maintenance of access points to existing public county roads from the site are included as part of the estimate.

Scope Development

The development of the estimate scope has its basis from previous LM 6000 power generation construction projects. The estimate also draws information from over thirty years' experience of LM6000 demolition and decommissioning projects.

The defined estimate scope is specific to SDPP site parameters, location, conditions and requirements using information extracted from other LM6000 projects. The combination of LM6000 construction projects, as well as demolition and decommissioning experience, formed the foundation for the SDPP demolition, decommissioning, and restoration estimate.

New Scope Changes
New scope changes are the result of perception of how the site will be demolished and decommissioned from various sources. The primary scope changes include: differences in site size, increases in buildings being demolished and in below ground scope, and removal of the storm water infiltration pond.

Estimated Scope Breakdown
The cost breakdown includes:

- General Costs,
- Site Construction,
- Concrete Wrecking,
- Building Wrecking,
- Steel Wrecking,
- Timber Wrecking,
- Thermal Protection/ Liner Wrecking,
- Equipment Wrecking,
- Mechanical Wrecking,
- Electrical Wrecking,
- Load and Haul.

For details in the above costs refer to the Summary Estimating Template. Revisions within the template are identified by r1 designation. The revisions were made by comparing the current scope to old scope generated by an April 2014 Decommissioning Estimate.

Quantity Development
Estimated quantities for specific commodities are developed from previous LM6000 estimates.

Quantity Changes
Quantity changes from the April Decommissioning Estimate were derived from the current scope changes and new quantity information from the Preliminary Definitive Jordan Cove Power Plant Basis of Quantity (BOQ).

Gas-Fired Energy Facility r1

Tab 01 - Summary Estimating Template

Enter facility name in cell G5. Enter data, as applicable, in the yellow-shaded cells in column D.

FACILITY NAME: **JCEP Restoration Estimate**

1. C jjjj

Task Description	Unit	Quantity	Unit Cost	Total	Comments	Methods/Assumptions
A. PERMITS						
1. DEMOLITION	EA	1	$123.60	$124		Permit required by local jurisdiction. Assumed cost: $120/each.
2. STREET USE	EA	1	$236.90	$237		Permit required by local jurisdiction. Assumed cost: $230/each.
3. UTILITIES	EA	1	$236.90	$237		Permit required by local jurisdiction. Assumed cost: $230/each.
4. EPA ASBESTOS NOTICE	EA	0	$2,310.00	$0	No asbestos	Assumed cost: $2,310/each.
Task Subtotal				**$598**		
B. MOBILIZATION						
1. TRUCKING ON/OFF	TR	20	$1,523.37	$30,426		18-wheel tractor and flat-bed trailer, 80,000 pound capacity @ $123.25/hour; 4 hours load/unload time plus 8 hour round trip for unit cost of $1,479/trip.
2. SUBCONTRACTOR	EA	1	$11,886.20	$11,886		One time charges for subcontractor mobilizations. Assumed cost: $11,540 for each mobilization for each subcontractor.
3. ON-SITE MOVES	EA	6	$253.90	$1,523		18-wheel tractor and flat-bed trailer, 80,000 pound capacity @ $123.25/hour; 1 hour load/unload time plus 1 hour movement on site for unit cost $246.50/trip.
4. HAND TOOLS & EQUIPMENT	TR	2	$2,538.95	$5,078		Assemble tools at contractor's yard, load tools onto truck, trucking to the site, unload site tools. Assumed cost: 20 hours/trip at $123.25/hour. Quantity must include one trip in and one trip out per contractor.
Task Subtotal				**$48,914**		
C. ENGINEERING						
1. ENGINEERING	LS	6	$5,920.02	$35,512		Engineering allowance for critical lift plans. Assumed lump sum cost: 40 hours @ $144.25/hour.
2. LAYOUT / TESTING	LS	1	$2,368.01	$2,368		Engineering allowance for site survey of existing site conditions. Assumed lump sum cost: 16 hours @ $144.25/hour.
3. CUSTOM TOOLS & EQUIP	LS	1	$5,920.02	$5,920		Custom tool allowance for critical lifts. Assumed lump sum cost of $5,770 to purchase special tools (not included below under "F. Protection" item 9, "Tools and Consumables").
Task Subtotal				**$43,800**		

D. PROJECT OVERHEAD						
1. SUPERVISION	HR	1920	$97.13	$186,629	Based on 3 supv. X 8 hrs x 16 weeks	Site management wages/vehicle/communication tools. Assumes $86.48/hr fully burdened wages, $5/hr vehicle cost and $3/hr computer/cell/radio cost.
2. FOREMAN	HR	800	$87.16	$69,731		Site supervision wages/vehicle/communication tools. Assumes $76.79/hr fully burden wages, $5/hr vehicle cost, $3/hr communication tools cost.
3. GUARD SERVICE	WK	16	$2,374.68	$37,995		3rd party guard service to protect salvage items while on the ground in stockpiles while contractor prepares to load scrap into delivery trailers or containers; assumes night and weekend service at $2,310/week.
4. CLERICAL	HR	640	$24.67	$15,790		Office staff assistant wages and communication tools. Assumes $22/hr fully burden wages and $2/hr computer cost.
5. JOBSITE OFFICE	WK	16	$143.92	$2,303		Jobsite office to house temporary demolition services personnel. Assumed 3rd party rental cost: $140/week.
6. TEMP. UTILITIES	WK	16	$61.68	$987		Jobsite temporary utilities during decommissioning. Assumed cost: $60/wk.
7. SPECIAL INSURANCE	LS	1	$1,182.20	$1,182		Special liability insurance if required by jurisdiction in addition to normal liability coverage. Assumed lump sum cost: $1,150.
8. SUBSISTENCE	WK	16	$2,367.48	$37,880		Temporary living expenses for 7 man crew at $329/man week, 4-day work week per man.
Task Subtotal				**$352,497**		
E. HAZARDOUS MATERIALS INSPECTIONS						
1. ASBESTOS ABATEMENT	EA	0	$23,080.00	$0	no asbestos	Hazardous material review. Assumed cost: $23,080/each review.
2. UNDERGROUND STORAGE TANKS	EA	0	$1,150.00	$0	no underground tanks	Hazardous material review. Assumed cost: $1,150/each review.
3. SAMPLING	LS	1	$98,500.00	$98,500	no lead	Hazardous material review. Assumed cost: $2,310/each review.
Task Subtotal				**$98,500**		
F. PROTECTION						
1. SIGNS	EA	4	$234.51	$938		Install, maintain and remove on-site demolition signs required for local notification. Assumed cost: $100 for material plus $130 labor for each sign.
2. FENCES	LF	1000	$2.36	$2,355	Allowance for temp fencing	Rent, install, maintain and remove temporary fencing required to protect property and public. Assumed cost: $2.31/linear foot.
3. PEDESTRIAN WALKWAY	LF	0	$11.77	$0	Not located in public area	Install, maintain and remove temporary pedestrian protection required in high public foot traffic areas. Assumed cost: $11.54/linear foot (includes materials).
4. SCAFFOLDING	CF	0	$1.17	$0	No scaffolding	Install, maintain and remove temporary scaffolding required for personnel access where motorized manlifts are not feasible. Assumed cost: $1.15/cubic foot (includes material).

5. SHORING	SF	0	$5.88	$0	No shoring required	Install, maintain and remove temporary shoring where required by local jurisdiction and conditions. Assumed cost: $5.77/square foot (includes material).
6. OPENINGS	EA	30	$23.53	$706	Allowance	Install, maintain and remove temporary opening coverings to protect public and demolition personnel. Assumed cost: $23.08/each (includes material).
7. DECKING	SF	0	$1.17	$0	No platforms required	Install, maintain and remove temporary decking for work platforms. Assumed cost: $1.15/square foot (includes material).
8. FLAGGING	DY	12	$301.16	$3,614		Temporary flagging for movement of oversized loads or disconnects. Assumes 8 hours per day @ $36.92/hour.
9. TOOLS AND CONSUMABLES	LS	2	$5,883.23	$11,766		Tool/consumable allowance for the site. Assumed lump sum cost: $5,770 for small crew.
Task Subtotal				**$19,380**		
G. UTILITY DISCONNECTS						
1. POWER	EA	1	$597.40	$597		Utility company support cost for disconnecting the site from the local utility system.
2. WATER	EA	1	$360.50	$361		Utility company support cost for disconnecting the site from the local utility system.
3. GAS	EA	1	$1,781.90	$1,782		Utility company support cost for disconnecting the site from the local utility system.
4. SEWER	EA	1	$360.50	$361		Utility company support cost for disconnecting the site from the local utility system.
Task Subtotal				**$3,100**		
2. SITE CONSTRUCTION						
A. PRELIMINARY WORK						
1. CUT & CAP LINES	EA	100	$604.79	$60,479		Cut and cap lines to be left in place below grade. Assumes 8 crew hours @ $41.34/hr plus materials.
2. PLANT SECURITY FENCE r1	**LF**	**11000**	**$0.91**	**$10,026**		**Remove existing facility fencing and gates.**
3. VEHICLE ENTRY GATE r1	**EA**	**1**	**$200.00**	**$200**		**Allowance**
4. EMPLOYEE TURNSTILE r1	**EA**	**1**	**$200.00**	**$200**		**Allowance**
5. EMERGENCY ACCESS GATE r1	**EA**	**1**	**$200.00**	**$200**		**Allowance**
6. SAW CUTTING, ETC.	LF	140	$3.38	$473	Based on General Arrangement drawing	Sawcutting at site battery limits connecting to public roadways. Assumes cutting 6" of asphalt/concrete paving estimated at $0.55/inch per linear foot.
7. RAIL SPUR DEMO	LF	0	$7.26	$0	No railroad	Remove rails, switches and ties and place in stockpile. Assumes crew production of 31 ft/hr (300 Excavator and 1 Laborer).
8. DRAIN TANKS/SYSTEMS	LS	2	$8,836.36	$17,673		Prepare facility for decommissioning by shutting off systems, draining tanks, purging lines and similar activities. Assumes a crew of 5 men for one week at $41.34/hr/man.

9. POND/SLUDGE EXCAVATION r1	**CY**	**26667**	**$6.53**	**$174,244**		**Remove existing/remaining operating debris from ponds to stockpile. Assumes a crew production rate of 50 cy/hr (300 Excavator and 2 Laborers).**
Task Subtotal				**$263,496**		
B. SITE GRADING						
1. ROADWAY REMOVAL (ASPHALT)	SY	5750	$0.98	$5,632		Remove and load existing asphalt/concrete paving 6" thick in a 10 cy end dump truck. Assumes crew production rate of 300 cy/day (300 Excavator and 1 Laborer).
2. ROADWAY REMOVAL (GRAVEL)	SY	7700	$0.73	$5,583		Remove and load existing gravel pavement 6" thick in a 10 cy end dump truck. Assumes crew production rate of 400 cy/day (300 Excavator and 1 Laborer).
3. SITE PREPARATION (TOPSOIL) r1	**SY**	**498522**	**$3.49**	**$1,737,490**		**Spread and grade 6" topsoil material imported at the cost of $1.86/sy. Assumes crew production rate of 400 cy/day (300 Excavator and 1 Laborer).**
4. SEEDING r1	**AC**	**103**	**$3,467.84**	**$357,188**		**Hydroseed areas that received topsoil.**
5. MASS EXCAVATION ONSITE	CY	0	$2.98	$0	No underground demolition	Excavate and stockpile site materials for reuse as backfill materials. Assumes crew production rate of 100 cy/hr (400 Excavator and 1 Laborer).
5A. MASS EXCAVATION OFFSITE	CY	0	$19.49	$0	No underground demolition	Excavate and haul (10 cy truck) to off-site stockpile for $10/cy. Assumes crew production of 100 cy/hour (400 Excavator and 1 Laborer).
6. MASS BACKFILL ONSITE	CY	2372	$6.30	$14,935	From plant stockpile	Backfill site materials from stockpiles onsite into excavations. Assumes crew production rate of 80 cy/hr (400 Excavator, Roller/Compactor, Dozer and 1 Laborer).
6A. MASS BACKFILL IMPORT	CY	2500	$17.85	$44,615	Misc backfill allowance	Backfill with imported materials costing $9.03/cy into mass site excavations. Assumes crew production rate of 80 cy/hr (400 Excavator, Roller/Compactor, Dozer and 1 Laborer).
7. POND RECLAMATION (Stormwater Pond) r1	**CY**	**14444**	**$6.11**	**$88,189**		**Remove pond embankments, fill pond swale area and grade area. Assumes crew production rate of 50 cy/hour (Dozer, Compactor and 1 Laborer).**
Task Subtotal				**$2,253,632**		
C. UNDERGROUND UTILITY REMOVAL						
1. FIREWATER LINES r1	**LF**	**22086**	**$5.45**	**$120,369**		**Remove and backfill underground fireline utilities . Assumes crew production rate of 400 lf/day (300 Excavator, Compactor and 1 Laborer).**
2. SEWER LINES AND DRAINS r1	**LF**	**18924**	**$7.27**	**$137,577**	**Includes gravity drains and process drains based on prelim def est qtys**	**Remove and backfill underground sewer lines/ drains . Assumes crew production rate of 300 ft/day (300 Excavator Compactor and 1 Laborer).**
3. GAS LINES r1	**LF**	**15533**	**$6.23**	**$96,771**	**Fuel Gas + small bore allowance Below Ground**	**Remove and backfill underground gas lines . Assumes crew production rate of 350 ft/day (300 Excavator Compactor and 1 Laborer).**

4. ELECTRICAL DUCTBANK r1	**LF**	**1200**	**$10.91**	**$13,092**		**Remove and backfill underground gas lines . Assumes crew production rate of 350 ft/day (300 Excavator Compactor and 1 Laborer).**
5. MANHOLE/CATCH BASIN/VAULT REMOVAL	EA	0	$649.12	$0	No underground demolition	Remove and backfill unit to 3 feet below finished grade. Assumes 2 crew hours/each (300 Excavator, Roller/Compactor and 1 Laborer).
6. TANKS	EA	0	$649.12	$0	No underground demolition	Remove below grade storage tanks to stockpile (10,000 gallon or smaller tanks). Assumes crew production rate of 2 hours/each tank (300 Excavator and 1 Laborer). Excavation and backfill tasks are included in the appropriate tasks elsewhere in the estimate.
Task Subtotal				**$367,809**		

3. CONCRETE WRECKING

Enter data on tab "03 Concrete Wrecking."

A. REINFORCED CONCRETE

1. SLAB ON GRADE r1	**CY**	**3479**	**$2.01**	**$7,008**		**[Quantity imported from Tab 03] Remove and stockpile 6" thick concrete slab on grade for on-site recycling. Assumes crew production of 300 cy/day (300 Excavator and1 Laborer).**
2. MINOR FOOTINGS	CY	5046	$3.54	$17,870		[Quantity imported from Tab 03] Remove and stockpile minor concrete footings for on-site concrete recycling. Assumes crew production of 175 cy/day (400 Excavator and 1 Laborer).
3. MASS FOUNDATIONS r1	**CY**	**5488**	**$8.69**	**$47,670**	**Includes BG Concrete**	**[Quantity imported from Tab 03] Break, remove and stockpile on-site concrete foundations for recycling. Assumes crew production of 150 cy/day (400 Excavator/hammer, 300 Excavator and1 Laborer).**
4. SUPERSTRUCTURE	CY	920	$5.66	$5,212		[Quantity imported from Tab 03] Break up superstructure concrete items, remove and deliver to stockpile. Assumes crew production of 150 cy/day (400 Excavator, Shear and 1 Laborer).
5. WALLS	CY	368	$5.66	$2,085		[Quantity imported from Tab 03] Break up concrete walls, remove and deliver to stockpile. Assumes crew production rate of 150 cy/day (400 Excavator, Shear and 1 Laborer).
Task Subtotal		15,301		**$79,843**		

B. NON-REINFORCED CONCRETE/OTHER

1. DEAD MEN	CY	0	$24.59	$0		[Quantity imported from Tab 03] Break, remove and stockpile for on-site concrete recycle. Assume crew production of 150 cy/day (400 Excavator/Hammer, 300 Excavator and 1 Laborer).
2. SECURITY RAILS	LF	0	$1.48	$0	Not in estimate	[Quantity imported from Tab 03] Break, remove and stockpile concrete security rails for on-site recycle. Assume crew production of 300cy/day (300 Excavator and 1 Laborer).

3. CONCRETE RECYCLE	CY	10880	$10.70	$116,378		[Quantity imported from Tab 03] Using mobile on-site concrete recycle equipment, load concrete rubble from stockpile into crusher jaw, crush concrete, sort rebar, and stockpile material for on-site backfill and metal scrap iron stockpile. Assume $10.39/cy for mobile plant operation.
4. PILING	EA	0	$141.67	$0	No underground demolition	[Quantity imported from Tab 03] Use crane and vibratory pile hammer to remove and stockpile steel piling below grade. Assume crew cost of $516.04/hr and crew production of 30 piles/day.
Task Subtotal				**$116,378**		

4. BUILDING WRECKING (All building wrecking assumes the structure is knocked down and put into stockpile for sorting.)

1. ADMINISTRATION r1	**SF**	**15,400**	**$2.40**	**$36,960**		**Remove building roof, walls and floors to on-site debris stockpile. Assume crew production of 100 sf/hr (300 Excavator and 1 Laborer).**
2. OPERATIONS BLDG r1	**SF**	**31,250**	**$3.89**	**$121,563**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
3. CONTROL BLDG r1	**SF**	**15,625**	**$3.89**	**$60,781**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
4. SDPP SWITCHGEAR POWERHOUSE r1	**SF**	**400**	**$3.89**	**$1,556**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
5. TRAIN 1 POWERHOUSE r1	**SF**	**1,400**	**$3.89**	**$5,446**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
6. TRAIN 2 POWERHOUSE r1	**SF**	**1,400**	**$3.89**	**$5,446**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
7. FUELGAS POWERHOUSE r1	**SF**	**1,200**	**$3.89**	**$4,668**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
8. FIREWATER PUMPS ENCLOSURE r1	**SF**	**200**	**$3.89**	**$778**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
9. HAZARDOUS MATERIALS SHELTER R1	**SF**	**1,000**	**$3.89**	**$3,890**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**

10. AQUEOUS AMMONIA STORAGE r1	**SF**	**300**	**$3.89**	**$1,167**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
11. SDPP FW PUMP POWERHOUSE r1	**SF**	**300**	**$3.89**	**$1,167**		**Remove block building roofing and floors to on-site debris stockpile. Assume crew production of 62 sf/hr (300 Excavator and 1 Laborer).**
12. WEATHER PROTECTION	SF	0	$0.65	$0	Not included	Assume crew production rate of 370 sf/hr (300 Excavator and 1 Laborer).
13. CEMS	SF	480	$2.68	$1,285	80 SF x 6 CEMS	Assume crew production rate of 93 sf/hr (300 Excavator and 1 Laborer).
14. WATER TREATMENT/ DE-MINERALIZATION	SF	9,694	$2.41	$23,353	Based on cost estimate	Assume crew production rate of 103 sf/hr (300 Excavator and 1 Laborer).
15. COOLING WATER/TOWER STRUCTURE	SF	0	$1.95	$0	No cooling tower, Air Cooled Condenser	Assume crew production rate of 123 sf/hr (300 Excavator and 1 Laborer).
16. SHOPS AND WAREHOUSE	SF	0	$2.21	$0	No shops or warehouses	Remove small building roofing, walls and flooring to on-site debris stockpile. Assume crew production of 110 sf/hr (300 Excavator and 1 Laborer).
17. TURBINE BUILDING	SF	0	$3.89	$0	No turbine bldg	Assumes crew production rate of 62 sf/hr (300 Excavator and 1 Laborer).
Task Subtotal		78,649		**$268,060**		

5. STEEL WRECKING (All steel wrecking assumes material is knocked down and put into stockpile for sorting.)						
Enter data on tab "05 Steel Wrecking."						
1. SUPERSTRUCTURE	TN	634	$60.14	$38,131		[Quantity imported from Tab 05] Wreck superstructure steel. Assume unit cost of $58.42/ton (400 Excavator/Shear and 1 Laborer).
2. MISCELLANEOUS METALS	TN	184	$86.88	$15,986		[Quantity imported from Tab 05] Remove miscellaneous steel materials such as ladders and handrail to stockpile. Assume unit cost of $84.39 per ton (400 Excavator/shear and 1 Laborer).
3. SOFT INTERIOR	SF	180	$0.48	$87		[Quantity imported from Tab 05] Wreck soft interior materials from within structures at the rate of $0.47/sf (5 Laborers and 2 Bobcat loaders).
4. SORT/CLEAN	TN	998	$30.40	$30,340		[Quantity imported from Tab 05] Sort and clean material delivered to stockpile from other tasks and prepare the material to be loaded into scrap and debris containers. Assume crew production rate of $29.53/ton (Shear, Magnet and 6 Laborers).
Task Subtotal		1,816		**$84,544**		

6. TIMBER WRECKING (All timber wrecking assumes material is knocked down and put into stockpile for sorting).						
Enter data on tab "06 Timber Wrecking."						
1. SALVAGE TIMBERS	MBF	0	$129.82	$0	No timber	[Quantity imported from Tab 06] Selectively remove salvage timber from structures at an assumed unit cost of $129.82/mbf (300 Excavator and 1 Laborer).
2. EQUIPMENT WRECKING	SF	0	$3.89	$0	No timber	[Quantity imported from Tab 06] Production wreck timber materials and place into stockpile at an assumed unit cost of $3.89/sf (300 excavator and 1 Laborer).

3. FLOOR BY FLOOR	SF	0	$12.98	$0	No timber	[Quantity imported from Tab 06] Selectively wreck timber materials and place them into stockpile assuming a unit cost of $12.98/sf (300 excavator and 1 Laborer).
Task Subtotal				$0		
7. THERMAL PROTECTION WRECKING						
Enter data on tab "07 Thermal Protection Wrecking."						
1. POND LINERS (Stormwater Pond) r1	**SY**	**13,333**	**$0.96**	**$12,800**		**[Quantity imported from Tab 07] Remove pond liners and place the material into the debris stockpile. Assumes crew production rate of 2,500 sf/hr (300 Excavator and 3 Laborers).**
2. INSULATION	SF	41,700	$0.73	$30,466		[Quantity imported from Tab 07] Remove insulation materials from equipment or facilities and deposit into on-site debris stockpile. Assume crew production of 466 sf/day (1 Laborer).
3. HAZARDOUS PAINT	SF	0	$17.72	$0	No hazardous paint	[Quantity imported from Tab 07] Remove hazardous paint, bag, tag and deposit into onsite storage containers for removal from site. Assume crew production of 3 sf/hr (1 Laborer).
Task Subtotal		41,700		$43,266		
8. EQUIPMENT WRECKING (All equipment is assumed to be stripped of all piping, housing, insulation, electrical and other prior to the equipment being knocked down and placed into stockpile).						
1. COMBUSTION TURBINE /GENERATOR	EA	6	$136,620.39	$819,722		Wreck components of the turbine/generator equipment and place them into the stockpile. Assumes a crew duration of 5 days to complete the wrecking (5 Laborers and a $150/hr crane).
2. INLET AIR EVAP COOLERS	EA	3	$24,381.50	$73,144		Wreck and place into stockpile. Assume crew duration of 1 day (3 Laborers and a Shear).
3. INLET AIR FOGGERS/FILTERS	EA		$12,190.75	$0		Wreck and place into stockpile. Assume crew duration of 1/2 day (3 Laborers and a Shear).
4. FUEL HEATERS	EA	6	$6,095.37	$36,572		Wreck and place into stockpile. Assume crew duration of 1/4 day (3 Laborers and a Shear).
5. HRSG	EA	6	$420,370.44	$2,522,223		Prepare HRSG for blasting subcontractor to fall the units (See tab "19 Specialty Contracts"). After the unit is on the ground, wreck the unit and place it into stockpile. Assume a crew duration of 10 days (5 Laborers, Shear and Excavator).
6. TURBINE EXHAUST STACKS	EA	6	$210,185.22	$1,261,111	HRSG Stacks	Wreck stacks assuming a unit cost of $100/Ton.
7. STEAM TURBINE/GENERATOR	EA	2	$54,648.19	$109,296		Wreck the components of the turbine/generator equipment and place them into the stockpile. Assumes crew duration of 2 days (5 Laborers and a $193.50/hr crane).
8. WATER-COOLED SURFACE COND.	EA	2	$73,564.83	$147,130		Wreck and place into stockpile. Assume crew duration of 4 days (1 Laborer and a Shear).
9. AIR COOLED CONDENSERS	EA	2	$184,963.03	$369,926		Wreck and place into stockpile. Assume crew duration of 10 days (1 Laborer and a Shear).
10. FEED WATER PUMPS	EA	12	$7,146.33	$85,756		Wreck and place into stockpile. Assumes crew duration of 1/4 day (5 Laborers and a $193.50/hr crane).

11. CONDENSATE PUMPS	EA	6	$5,254.59	$31,528		Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
12. MISCELLANEOUS PUMPS	EA	49	$3,152.77	$154,486	Equipment list	Wreck and place into stockpile. Assumes crew duration of 1/4 day (3 Laborers and a Carry Deck).
13. AIR COMPRESSORS	EA	3	$3,152.77	$9,458		Wreck and place into stockpile. Assumes crew duration of 1/4 day (3 Laborers and a Carry Deck).
14. STANDBY DIESEL/FIRE PUMP GENE	EA	5	$5,254.59	$26,273		Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
15. GAS COMPRESSORS	EA	3	$5,254.59	$15,764		Wreck and place into stockpile. Assumes crew duration of 1/3 day (3 Laborers and a Carry Deck).
16. GAS METERING STATION	EA	1	$12,190.75	$12,191		Wreck and place into stockpile. Assumes crew duration of 1/2 day (3 Laborers and a Shear).
17. FIREWATER TANKS r1	**EA**	**2**	**$8,144.69**	**$16,289**		**Wreck and place into stockpile (assumes a 20 ft diameter, 16 ft tall tank). Assumes crew duration of 1/3 day (3 Laborers and a Shear).**
18. WATER TREATMENT EQUIPMENT r1	**EA**	**1**	**$10,000.00**	**$10,000**	**Allowance**	
19. RAW WATER TANKS	EA	0	$12,190.75	$0	No raw water tank.	Wreck and place into stockpile (assumes a 40 ft diameter, 16 ft tall tank). Assumes crew duration of 1/2 day (3 Laborers and a Shear).
20. DEMINERALIZED WATER TANKS	EA	1	$44,490.48	$44,490		
21. FRESH WATER TANKS	EA	1	$44,490.48	$44,491	Service Water tank	
22. FLARE KNOCKOUT DRUM r1	**EA**	**1**	**$5,000.00**	**$5,000**	**Allowance**	
23. CO/SCR CATALYST	CF	4,320	$71.18	$307,519	HRSG SCR and CO Cat, 30'high x 12' width x 1' = 360 CF for SCR x 2 for CO x 6 HRSGs = 4,320 CF	Assume $71.18.00 per CF
Task Subtotal				**$6,102,371**		

9. MECHANICAL WRECKING (All Mechanical materials are assumed to be stripped of other materials in other tasks. This task assumes wrecking the pipe and valves only.)						
Enter data on tab "15 Mechanical Wrecking."						
1. COOLING WATER PIPING r1	**LF**	**7,263**	**$4.67**	**$33,930**	**Based on 2 blocks - 3 x1 LM6000 includes Below Ground (Based on previous estimate)**	**[Quantity imported from Tab 15] Remove piping material to stockpile. Assume crew production rate of 0.014 man-hrs/lf (Shear).**
2. GAS PIPING r1	**LF**	**0**	**$5.34**	**$0**	**Based on 2 blocks - 3 x1 LM6000 includes Below Ground (Based on previous estimate)**	**[Quantity imported from Tab 15] Remove piping material to stockpile. Assume crew production rate of 0.016 man-hrs/lf (Shear).**
3. ABOVE GROUND PIPING r1	**LF**	**47,011**	**$4.67**	**$219,618**	**Based on 2 blocks - 3 x1 LM6000 (Based on Prelim Def Estimate Qtys 9/14)**	**[Quantity imported from Tab 15] Remove piping material to stockpile. Assumes crew production rate of 0.014 man-hrs/lf (shear).**
4. 12" FUEL GAS r1	**LF**	**5,000**	**$5.34**	**$26,700**	**Added scope Aboveground to LNG Facility from Power Block**	**Remove piping material to stockpile. Assume crew production rate of 0.016 man-hrs/lf (Shear).**
5. 36" TREATED GAS LINE r1	**LF**	**5,000**	**$5.34**	**$26,700**	**Added scope Aboveground to LNG Facility from Gas Conditioning**	**Remove piping material to stockpile. Assume crew production rate of 0.016 man-hrs/lf (Shear).**
6. RAW WATER PIPING r1	**LF**	**2,118**	**$4.67**	**$9,895**	**Based on 2 blocks - 3 x1 LM6000 includes Below Ground (Based on previous estimate)**	**[Quantity imported from Tab 15] Remove piping material to stockpile. Assumes crew production rate of 0.014 man-hrs/lf (shear).**
7. FRESH WATER PIPING r1	**LF**	**10,386**	**$4.67**	**$48,520**	**Based on 2 blocks - 3 x1 LM6000 includes Below Ground (Based on previous estimate)**	**[Quantity imported from Tab 15] Remove piping material to stockpile. Assumes crew production rate of 0.014 man-hrs/lf (shear).**

Task Subtotal		76,778		**$365,363**		

10. ELECTRICAL WRECKING						
Enter data on tab "16 Electrical Wrecking."						
1. TRANSFORMERS	EA	14	$2,066.04	$28,925	8 GSU and 6 Aux transformers, Based on 2 blocks - 3 x1 LM6000	[Quantity imported from Tab 16] Drain systems, unhook utilities, preserve transformers for future use. Assumes 5 crew hours per transformer (boom truck and 4 Laborers).
2. MOTOR CONTROL CENTER	EA	150	$908.40	$136,260	Based on 2 blocks - 3 x1 LM6000	[Quantity imported from Tab 16] Wreck motor control centers. Assume crew production of 4 hours/MCC (300 Excavator and 1 Laborer).
3. WIRING r1	**LF**	**1,734,680**	**$0.06**	**$107,099**	**Based on 2 blocks - 3 x1 LM6000 includes Below Ground**	**[Quantity imported from Tab 16] Remove wiring from equipment/poles or within towers. Assume crew production of 3,000 ft/hr (300 Excavator and 1 Laborer).**
4. SWITCH YARD r1	**SF**	**225,000**	**$0.41**	**$92,610**		**[Quantity imported from Tab 16] Wreck equipment and small structures in switch yards to stockpile. Assume crew production of 600 sf/hr (300 Excavator and 1 Laborer).**
5. TOWERS r1	**EA**	**18**	**$1,816.80**	**$32,702**	**Allowance based on 1 tower/500 lf**	**[Quantity imported from Tab 16] Wreck and stockpile electrical tower. Assume crew production rate of 3 hrs/each tower (300 Excavator and 1 laborer).**
6. GROUNDING r1	**LF**	**68,320**	**$0.06**	**$4,218**	**Based on 2 blocks - 3 x1 LM6000**	**[Quantity imported from Tab 16] Remove grounding from underground facilities around equipment. Assume crew production rate of 3,000 ft/hr (300 Excavator).**
7. TRANSMISSION LINE WIRING r1	**MI**	**3**	**$200.38**	**$523**	**115kV Double Circuit Line to LNG Facility and 115kV Export Transmission Line**	**[Quantity imported from Tab 16] Remove and reel up transmission line wire. Assume crew production rate of 1 mile/hour (line truck, driver and spotter).**
8. BREAKER/INSULATORS/MISC	EA	8	$6.08	$49	Based on 2 blocks - 3 x1 LM6000	[Quantity imported from Tab 16] Remove and place into stockpile. Assume 7 each/hr (1 Laborer).
Task Subtotal		1,734,680		**$402,385**		

11. LOAD & HAUL						
1. LOAD & HAUL - DEBRIS	LD	61	$634.13	$38,737		[Quantity imported from "4. Building Wrecking" above] Load debris from stockpile into 80,000 lb, 12 cy side dump truck (300 Excavator and 1 Laborer). Haul debris to disposal site. Assumes 2 hr truck time for each load at $116.85/hr.
2. DISPOSAL - DEBRIS	LD	61	$1,521.92	$92,969		[Quantity imported from "4. Building Wrecking" above] Tipping fees at disposal site for accepting debris hauled from site.
3. LOAD & HAUL CONCRETE	LD	900	$240.48	$216,430		Haul concrete to disposal site in a 12 cy side dump truck. Assumes 2 hr truck time at $116.85/hr.
4. DISPOSAL - CONCRETE	LD	900	$92.61	$83,349		Tipping fees at disposal site for accepting concrete hauled from site.

5. SCRAP STEEL	LD	40	$400.77	$15,999	Load only FOB Jobsite. Calculation based on 25 tons per load.	[Quantity imported from Tab 5 Steel] Load only scrap metal from stockpiles into containers provided by scrap metal vendors, F.O.B. jobsite. Assumes a crew production of 2 hours per load (300 Excavator).
Task Subtotal		1,062		**$447,484**		

12. COST SUBTOTAL		$11,361,418		Sum of all task subtotals.
OVERHEAD @	10.0%	$1,136,142		Home office overhead and support @ 10% of Cost Subtotal.
COSTS + OVERHEAD		$12,497,560		
PROFIT @	10.0%	$1,249,756		Contractor fee @ 10% of Cost Subtotal + Overhead
COSTS + OVERHEAD + PROFIT		$13,747,316		
INSURANCE @	3.0%	$412,419		Industrial insurance @ 3% of Cost Subtotal + Overhead + Profit Subtotal
COSTS + OVERHEAD + PROFIT + INSURANCE		$14,159,735		
13. SCRAP CREDIT (Currently not allowed by EFSC.)		$0		[Imported from Tab 18]
SUBTOTAL (after deduction for scrap credit)		$14,159,735	Currently not allowed by EFSC.	
14. SEPARATE SPECIALTY CONTRACTS		$0		[Imported from Tab 19]
SUBTOTAL (including specialty contracts)		$14,159,735		
15. BOND				
@	1%	$141,597		
SUBTOTAL (including performance bond)		$14,301,333		
16. HAZARDOUS MATERIALS ADDER				
HAZARDOUS MATERIALS MANAGEMENT CONTINGENCY				
	LS	$500,000	[default value = $500,000]	Minimum estimate for performance of Phase I and Phase II Environmental Site Assessments and remediation costs for clean-up of minor spills and contamination. Increase the amount if higher costs are anticipated.

APPENDIX W-3

JCEP Restoration Estimate: Cost Estimate for Facility Site Restoration r1

JCEP Restoration Estimate

COST ESTIMATE FOR FACILITY SITE RESTORATION r1

(2nd Quarter 2014 Dollars)

Adjustment Factor: 1.06917 **Current Quarter:** 2Q 2014

GDP Deflator 2010: 101.2

GDP Deflator 2014: 108.2

http://www.oregon.gov/DAS/OEA/economic.shtml

rev 1 10/9/2014

General Costs			
A. PERMITS			$598
B. MOBILIZATION			$48,914
C. ENGINEERING			$43,800
D. PROJECT OVERHEAD			$352,497
E. HAZARDOUS MATERIALS INSPECTIONS/ SAMPLING			$98,500
F. PROTECTION			$19,380
G. UTILITY DISCONNECTS			$3,100
General Costs Subtotal			**$566,789**
Site Construction			
A. PRELIMINARY WORK			$263,496
B. SITE GRADING			$2,253,632
C. UNDERGROUND UTILITY REMOVAL			$367,809
Site Construction Subtotal			**$2,884,937**
Concrete Wrecking			
A. REINFORCED CONCRETE			$79,843
B. NON-REINFORCED CONCRETE			$116,378
Concrete Wrecking Subtotal			**$196,221**
Building Wrecking			**$268,060**
Steel Wrecking			**$84,544**
Timber Wrecking			**$0**
Thermal Protection/Liners Wrecking			**$43,266**
Equipment Wrecking			**$6,102,371**
Mechanical Wrecking			**$365,363**
Electrical Wrecking			**$402,385**
Load & Haul			**$447,484**
Costs Subtotal			**$11,361,419**
Overhead @	10%		$1,136,142
Profit @	10%		$1,249,756
Insurance @	3%		$412,419
Specialty Contracts (subcontracted work)			**$0**
Subtotal			**$14,159,736**
Subtotal Adjusted to Current Dollars	2Q 2014		**$15,139,164**
Performance Bond @	1%		$151,392
Gross Cost (Adjusted)			**$15,290,556**
Administration and Project Management @		10%	$1,529,056
Future Developments Contingency @		20%	$3,058,111
Hazardous Materials Management Contingency			$500,000
Total Site Restoration Cost (current dollars)			**$20,377,723**
Total Site Restoration Cost (rounded to nearest $1,000)			**$20,378,000**

EXHIBIT X
NOISE
OAR 345-021-0010(1)(X)

CONTENTS

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

OAR 345-021-0010(1)(x). I*nformation about noise generated by construction and operation of the proposed facility, providing evidence to support a finding by the Council that the proposed facility complies with Oregon Department of Environmental Quality's noise control standards in OAR 340-035-0035.*

Jordon Cove Energy Project (JCEP or the "Applicant") plans to construct and operate a combined-cycle power plant facility at South Dunes Power Plant (SDPP) on the North Spit of Coos Bay in Coos County, near North Bend, Oregon. The two closest resident Noise Sensitive Properties (NSPs) are permanent residences described below and shown on Figure X-1. The SDPP is approximately 1.0 and 1.5 miles from NSP-E and NSP-S, respectively. In addition, the Horsfall Sand Campground is about 2,000 feet to the north of the SDPP and a prior facility, known as the Box Car Hill Campground, was located 400 feet north of the SDPP site boundary. However, the Applicant has leased the former Box Car Hill Campground and it will no longer be used as a campground.

NSP-E is located on East Bay Street about 200 feet east of US 101 in North Bend. The primary noise sources in the vicinity of NSP-E are vehicular traffic on the TransPacific Parkway and US Highway 101, recreational vehicle use in the Oregon Dunes National Recreation Area, boat traffic in Coos Bay, and occasional aircraft noise from the Southwest Oregon Regional Airport.

NSP-S is located at the corner of Colorado Avenue and Arthur Street in a residential subdivision on the south side of Coos Bay in North Bend. The acoustical environment is typical of quiet, suburban neighborhoods, with occasional aircraft noise from the Southwest Oregon Regional Airport.

The Horsfall Sand Campground is located to the north of the SDPP and is used for equestrian camping. The primary noise sources in the vicinity of the Horsfall Sand Campground are: vehicular traffic on the TransPacific Parkway, recreational vehicle use in the Oregon Dunes National Recreation Area, boat traffic in Coos Bay, and occasional aircraft noise from the Southwest Oregon Regional Airport.

The Box Car Hill Campground was previously used for dune buggy recreation and camping, however as stated above, the Applicant has entered into a 99-year lease agreement with the owner of the Box Car Hill Campground. The terms of the lease agreement prohibit the use of the property as a "noise sensitive property." Therefore, the site does not qualify as a noise sensitive property as defined by OAR 340-035-0015(38).

> The Premises shall be used for any lawful purpose including, without limitation, installation of temporary office trailers, construction parking and storage, development and construction of industrial facilities and buildings, and development and construction of power production facilities. In no event, however, may Tenant use the Premises for the operation of a "Noise Sensitive Property" (as such term is defined on the date hereof in OAR 340-035-0015(38)) in any portion of the Premises that would be considered an "appropriate measurement point" as specified in OAR 340-035-0035(3)(b).

Furthermore, even if the Applicant did not prohibit the use of the property as a "Noise Sensitive Property" the site qualifies for an exemption and an exception. Oregon Administrative Rules (OAR) 340-035-0035(5)(g) exempts noise that originates on construction sites from meeting the standards in OAR 340-035-0035(1). The site also qualifies for the exception pursuant to OAR 340-035-0035(6)(d) because the site (formerly Box Car Hill Campground) is controlled by the person (the Applicant) who also controls or owns the noise source. Since the Applicant will control and own the noise source (the SDPP) and will also control the site (the area formerly known as the Box Car Hill Campground), the site would qualify for an exception.

While the site will not be a "noise sensitive property," JCEP offers the analysis below regarding predicted SDPP construction sound levels for informational purposes.

Regarding noise from SDPP operation, OAR 340-035-0035(1) limits the statistical sound levels (A-weighted decibels [dBA]) in any one hour for new and existing industrial and commercial noise sources. Since the SDPP site was previously used by a paper mill, which was closed in 2003, the limits for new industrial construction on a *previously used* industrial site in accordance with OAR 340-035-0035(1)(b)(A) and Table 8 of OAR 340-035-0035 are applicable to the SDPP. Based on Table 8, the hourly, nighttime, and L_{50} sound level resulting from SDPP operation should be limited to 50 dBA at NSP-E, NSP-S, and Horsfall Sand Campground. For the purposes of this analysis, this limit is assumed to apply at a location on the aforementioned Noise Sensitive Properties selected in accordance with OAR 340-035-0035(3). OAR 340-035-0035(3) states noise must be measured from "an appropriate measurement point" on a "noise sensitive property" that is either "25 feet toward the noise source from that point on the noise sensitive building nearest the source" or "that point on the noise sensitive property line nearest the noise source," depending on which is farther from the source. While the regulation allows an applicant to use the further of these two points, for the purpose of this analysis, the applicant used a more conservative approach (i.e. utilizing the measurement point closer to the noise source) to predict sound levels. The sound levels were predicted at the location along the NSP receiver property line that is nearest to the SDPP. Since noise from SDPP operations is expected to be steady-state, all the statistical sound levels should be approximately equal. Thus, the lowest limit associated with the hourly L_{50} of 50 dBA is considered the most stringent of the OAR requirements.

2.0 PREDICTED NOISE LEVELS

OAR 345-021-0010(1)(x)(A). *Predicted noise levels resulting from construction and operation of the proposed facility.*

2.1 CONSTRUCTION

OAR 340-035-0035(5)(g) exempts sound that originates from construction sites from meeting the rules in OAR 340-035-0035(1). Nonetheless, noise associated with SDPP construction activities was reviewed by JCEP. SDPP construction noise will be intermittent, as equipment is operated on an as-needed basis and will occur on weekends and evenings 24 hours a day, seven days a week. No blasting is anticipated to be required at this time.

Major construction phases will consist of site preparation (including haul road and barge berth preparation), foundation construction, building and equipment erection, and site clean-up and facility start-up. Noise emissions will vary with each phase of construction depending on the construction activity and the associated construction equipment required for each phase. The site preparation phase will require the use of heavy diesel-powered earth moving equipment. Examples of this equipment include backhoes, bulldozers, compactors, dump trucks, graders, and front end loaders. Noise emissions during site preparation will be dominated by the diesel engine noise. The foundation construction phase primarily involves concrete handling equipment such as concrete trucks, mixers, vibrators, pumps, and pile driving equipment. Some earth moving equipment will also be required to backfill the foundations. Foundation construction activities will primarily be centered at the power block equipment area. The equipment and building installation phase will involve diesel-powered earth moving equipment, mobile cranes, equipment delivery, impact wrenches, saws, drills, and air compressors. Again, these activities will primarily be centered at the power block equipment area. The site cleanup and facility startup phase will generally result in lower noise emissions than the preceding construction phases.

The variable nature of construction noise is best represented by an “average” sound level, in accordance with methodologies outlined by the U.S. Environmental Protection Agency (EPA) (e.g., *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*, EPA Publication NTID300.1, December 1971) and other construction noise resources (e.g., *Power Plant Construction Noise Guide*, Bolt Beranek and Newman Report No. 3321, May 1977). The “average” sound levels account for the type and quantity of equipment, the typical usage of each piece of equipment, and typical sound levels of the equipment used during each phase of construction. The typical types of equipment, equipment usage, and equipment sound emissions (at a distance of 50 feet) for each phase of construction are listed in Table X-1.

While the “average” sound level is generally representative of construction activities, certain activities will produce temporary elevations in the sound level. Contrastingly, decreased noise emissions will occur during reduced construction activities. The estimated “average” sound levels from construction equipment at distances corresponding to distances to each receptor are provided in Table X-2. Note that while these sound levels are called "average" sound levels, they are a conservative representation of construction sound levels. In accordance with the methodologies cited above, the "average" sound level estimates only include the effect of geometrical spreading of sound. Attenuation due to ground absorption, atmospheric absorption, and shielding from terrain are not included. Further, the "average" sound level assumes that all equipment for each phase of construction is operating simultaneously at similar distances from a receptor, which is a conservative approach.

Note also that estimated worst-case sound levels from steam blow have been included in Table X-2. Steam blow is an intermittent cleaning / facility start-up activity that typically takes place five or six times for each power block over a two to three week period. A typical steam blow involves sending high or low pressure steam through process piping for a period of roughly 10 to 15 minutes. Due to the SDPP construction schedule, the power blocks will be subjected to steam blows roughly four to eight months apart. Steam blow for this project will be a silenced activity that will take place relatively close to the power block area. When silenced, steam blow typically results in sound levels at 50 feet away that are no greater than approximately 100 dBA.

Table X-1. SDPP Construction Equipment Information

Construction Equipment	Typical Assumed Sound Levels @ 50 ft	Estimated Equipment Quantity and Usage (%)	
		Qty.	Usage
Air Compressor	70 to 80 dBA	1 to 4	25%
Backhoe	80 to 90 dBA	1 to 3	70 to 95%
Bush Hammer	70 to 80 dBA	4	25%
Chop Saw	60 to 70 dBA	4 to 5	25 to 75%
Compactor	75 to 85 dBA	2 to 5	50 to 95%
Concrete Pump	70 to 80 dBA	1	10%
Concrete Saw	85 to 95 dBA	2	5%
Concrete Vibrator	65 to 75 dBA	4	16%
Diesel Generator	65 to 75 dBA	1 to 4	100%
Dozer	75 to 85 dBA	1 to 4	35 to 95%
Drill	80 to 90 dBA	1 to 4	16 to 20%
Front End Loader	75 to 85 dBA	2	33 to 70%
Grader	75 to 85 dBA	1	10 to 80%
Grinder	75 to 85 dBA	60	25%
Impact Wrench	80 to 90 dBA	10	10%
Light Plants	70 to 80 dBA	8 to 16	10%
Man Lifts	65 to 75 dBA	20	40%
Mobile Crane	75 to 85 dBA	1 to 6	15 to 80%
Pavement Breaker	75 to 85 dBA	1	30%
Pile Driving - Impact	95 to 105 dBA	1	5%
Pile Driving - Vibratory	85 to 95 dBA	1	10%
Roller	75 to 85 dBA	2	25%
Stationary Crane	75 to 85 dBA	2	30%
Sump Pump	70 to 80 dBA	5	10%
Threading Machine	80 to 90 dBA	10	20%
Torque Wrench	75 to 85 dBA	2 to 5	16 to 25%
Trailer Transporter	85 to 95 dBA	4	5%
Trencher	80 to 90 dBA	1	10 to 50%
Troweling Machine	80 to 90 dBA	3	10%
Truck	75 to 85 dBA	4 to 19	15 to 95%
Welder	75 to 85 dBA	10	70%

Table X-2. Estimated "Average" Construction Sound Levels [(1)]

JCEP SDPP Construction Estimated "Average" Sound Levels [(1)]						
Construction Phase / Activity	**Construction Area**		**Reference**	**NSP-E**	**NSP-S**	**Horsfall**
Haul road / Barge berth preparation 11/2015 thru 2/2016	Barge berth	Distance	50 ft	7200 ft	5600 ft	2300 ft
		L_{av}	86 dBA	43 dBA	45 dBA	53 dBA
	Transmission corridor	Distance	50 ft	7200 ft	7200 ft	2500 ft
		L_{av}	86 dBA	43 dBA	43 dBA	52 dBA
Site Preparation	Power block	Distance	50 ft	5800 ft	8400 ft	2300 ft
		L_{av}	89 dBA	48 dBA	44 dBA	56 dBA
Foundation Construction	Barge berth 3/2017 thru 12/2019	Distance	50 ft	7200 ft	5600 ft	2300 ft
		L_{av}	87 dBA	44 dBA	46 dBA	54 dBA
	Power block 1/2017 thru 7/2017	Distance	50 ft	5800 ft	8400 ft	2300 ft
		L_{av}	87 dBA	46 dBA	43 dBA	54 dBA
	Transmission corridor 9/2018 thru 12/2019	Distance	50 ft	7200 ft	7200 ft	2500 ft
		L_{av}	87 dBA	44 dBA	44 dBA	53 dBA
Building / Equipment Erection	Power block 10/2017 thru 10/2019	Distance	50 ft	5800 ft	8400 ft	2300 ft
		L_{av}	87 dBA	45 dBA	42 dBA	53 dBA
	Transmission corridor 3/2019 thru 10/2019	Distance	50 ft	7200 ft	7200 ft	2500 ft
		L_{av}	87 dBA	44 dBA	44 dBA	53 dBA
Site Clean-up / Facility Start-up 1/2017 thru 10/2019	Power block	Distance	50 ft	5800 ft	8400 ft	2300 ft
		L_{av}	82	40	37	48
Steam Blow - Silenced [(2)]	Power block	Distance	50 ft	5800 ft	8400 ft	2300 ft
		L_{av}	≤ 100 dBA	≤ 59 dBA	≤ 55 dBA	≤ 67 dBA

Notes:

(1) Estimates are conservative. Assumptions include simultaneous operation of all equipment from similar distances and attenuation from geometrical spreading only. Sound levels include construction noise only.

(2) Sound level during and resulting from steam blow only.

2.2 OPERATION

During normal operation, the major SDPP noise sources are anticipated to be the equipment packages with associated sound levels listed in Table X-3.

Table X-3. SDPP Equipment Sound Levels

Equipment Package / Component	Qty.	Sound Level	Source Type	Source Height	Octave Band Sound Levels (dB)									Overall Sound Level (dBA)
					32 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
HRSG Stack Exit	6	L_w [(1)]	Point [(2)]	100 ft	112	120	122	119	110	109	96	71	52	114
HRSG Casing	6	L_w [(1)]	Area [(3)]	66 ft	104	109	105	97	87	86	74	54	24	94
STG Enclosure [(5)]	2	L_p [(4)] @ 3 ft	Area [(3)]	30 ft	99	88	85	82	85	78	73	72	70	85
ACC Fan [(6)]	12	L_w [(1)]	Point	62 ft	108	107	113	111	107	101	94	89	76	108
Fuel Gas Compressor [(5)]	3	L_w [(1)]	Area [(3)]	13 ft	91	91	95	99	103	106	105	101	95	110
FGC Cooler Fan	2	L_w [(1)]	Point	10 ft	106	106	105	102	97	95	89	83	77	100
Step Up Transformer	8	L_w [(1)]	Area [(3)]	13 ft	102	108	110	105	105	99	94	89	82	105
Boiler Feed Pump	6	L_w [(1)]	Point	6 ft	103	109	107	106	105	104	103	102	98	110
CT Inlet System	6	L_w [(1)]	Area [(3)]	39 ft	113	112	105	113	108	103	97	94	88	110
CTG Compartments	6	L_w [(1)]	Area [(3)]	14 ft	107	107	107	108	101	97	92	91	88	104

Notes:
(1) Sound power level (dB re 1 pW)
(2) Includes standard stack directivity.
(3) Includes horizontal and vertical area sources.
(4) Sound pressure level (dB re 20 µPa)
(5) Furnished with enclosure to reduce noise to specified sound pressure level.
(6) "Low-noise" fans.

An acoustical model of the SDPP facility was created (described in OAR 345-021-0010(1)(x)(B) below) and the results indicate that the predicted, steady-state sound levels resulting from SDPP operation are approximately 44 dBA, 39 dBA, and 47 dBA at NSP-E, NSP-S, and the Horsfall Sand Campground, respectively. The predicted SDPP sound level contours in 5-dBA increments are shown on Figure X-2. Predicted SDPP sound levels include noise contributions from SDPP sound sources only and do not include any other sources of noise such as background noise.

For informational purposes, the existing ambient sound levels for the locations identified above can be inferred from information included in Section 9.2.1.2 of the JCEP LNG Terminal Project FERC Resource Report 9 (RR9), dated May 2013 (available via http://elibrary.ferc.gov). Attached in relevant part as Appendix X-1. An ambient sound level survey was conducted from 11 to 18 April 2013 to quantify the existing sound levels at the nearest noise-sensitive receptors. The receptors are NSP-E and NSP-S described above. The measured ambient L_{eq} sound levels—which are often comparable to the L_{50} sound levels—in the vicinity of NSP-E (i.e., on Bay Street east of Highway 101) were 43 to 64 dBA, and were mainly influenced by traffic on Highway 101. The measured ambient L_{eq} sound levels in the vicinity of NSP-S (i.e., at the corner of Colorado Avenue and Arthur Street) were 32 to 58 dBA and were mainly influenced by local traffic, industrial and construction noise, and ocean surf noise at night. Daytime short-term L_{eq} sound levels of 55 to 60 dBA were measured at a nearby campground, which was described as "Boxcar" Campgrounds in RR9, but which appeared to be closer to Horsfall Campground on the aerial provided in Figure 9.2-1. The sound levels at the campground were influenced by frequent truck traffic.

Section 9.2.1.2 of RR9 concludes the following regarding noise sensitive areas (NSAs):

> In summary, there are no NSAs within one mile of the acoustic center of the Project site. This is a significant buffer that should significantly reduce the potential for any noise impacts. Noise levels at existing NSAs nearest the Project site are controlled primarily by vehicular traffic. Noise levels experienced at the NSAs are similar in level to those in suburban areas where traffic is the primary source of noise.

In general, the same conclusions can be drawn for the SDPP facility based on a review of the existing conditions and the predicted operational SDPP contributions provided above.

3.0 COMPLIANCE WITH APPLICABLE REGULATIONS

OAR 345-021-0010(1)(x)(B). *An analysis of the proposed facility's compliance with the applicable noise regulations in OAR 340-035-0035, including a discussion and justification of the methods and assumptions used in the analysis.*

The SDPP is expected to comply with applicable OAR-340-035-0035(1)(b)(A) noise limits. The acoustical model of the SDPP facility was created in accordance with International Organization for Standardization (ISO) 9613 using commercially available Cadna/A software (version 4.4.145) from DataKustik GmbH. The model simulated the outdoor propagation of sound from the equipment listed above and accounted for sound wave divergence, atmospheric and ground absorption, sound directivity, and shielding due to interceding barriers and terrain. For ground absorption, a "G" value of 0.0 ("Hard Ground" in accordance with ISO 9613-2) was applied to all bodies of water, including Coos Bay, and a "G" value of 0.8 ("Mixed Ground" in accordance with ISO 9613-2) was conservatively applied to absorptive ground areas comprised of, e.g., dirt or grass. A database was developed that specified the location, octave-band sound levels, and sound directivity of each noise source. The model calculated the A-weighted sound pressure levels due to SDPP noise contributions at receptor locations, including NSP-E, NSP-S and Horsfall Sand Campground. In accordance with ISO 9613, the acoustical model includes meteorological assumptions favorable to the propagation of sound. For example, the acoustical model assumes all receptors are downwind of all sound sources and that there is a moderate temperature inversion present such as might occur on a clear night. While ISO 9613 methodologies do not cover inversion conditions over water, the meteorological assumptions—as well as other modeling assumptions, such as source sound levels—are generally conservative. The facility sound levels at receptors will naturally fluctuate depending on the exact weather conditions. However, the facility sound levels are not expected to exceed the OAR hourly L_{50} limit of 50 dBA even when considering the possibility of a strong temperature inversion over Coos Bay. For example, the modeling results were recalculated for the NSP-E receptor assuming the presence of a stronger temperature inversion than the conservative, moderate inversion assumed by ISO 9613. Even under this condition, the facility sound levels at NSP-E would not be expected to exceed 50 dBA. Thus, the Applicant is compliant with the applicable noise regulations in OAR 340-035-0035.

Noise modeling was based on normal operation of all equipment listed above. Normal operation excludes intermittent activities such as start-up, shut-down, and any other abnormal or upset operating conditions. As noted above, the sound levels resulting from SDPP operation are expected to be 44, 39, and 47 dBA at NSP-E, NSP-S, and the Horsfall Sand Campground respectively. For these sites, the expected steady-state, hourly, nighttime L_{50} sound level resulting from SDPP operation is not expected to exceed the lowest applicable OAR limit of 50 dBA.

4.0 MEASURES DESIGNED TO REDUCE NOISE

OAR 345-021-0010(1)(x)(C). *Any measures the applicant proposes to reduce noise levels or noise impacts or to address public complaints about noise from the facility.*

The measures the Applicant proposes to reduce noise levels are as follows. For SDPP operations and equipment, the air-cooled condensers will use “low-noise” fans, the fuel gas compressors and steam turbine generator will be furnished with enclosures, and the heat recovery steam generators offer inherent noise reduction for the turbine exhaust. In addition, stack silencers may be used to reduce noise levels during steam blows during construction. Other equipment packages will be specified as necessary to minimize noise contributions in accordance with the project requirements. The noise mitigation measures described are included in the determination of SDPP operational sound levels (previous section).

In order to address complaints about noise from the facility, a complaint procedure acceptable to the Oregon Department of Energy staff will be finalized prior to construction of the SDPP. The complaint procedure implemented will establish an identifiable point of contact and method to deliver noise complaints about the facility.

5.0 MEASURES TO MONITOR NOISE

OAR 345-021-0010(1)(x)(D). *Any measures the applicant proposes to monitor noise generated by operation of the facility.*

Due to the distance of the SDPP to the residential receptors and that operation noise generated by the SDPP is projected to be below 50 dBA as demonstrated by the acoustical modeling results, JCEP does not propose any noise monitoring programs during SDPP operation. However, JCEP will undertake noise monitoring as necessary to meet the requirements of OAR 340-035-0035(4)(a).

6.0 NAMES AND ADDRESSES OF OWNERS WITHIN ONE MILE

OAR 345-021-0010(1)(x)(E). *A list of the names and addresses of all owners of noise sensitive property, as defined in OAR 340-035-0015, within one mile of the proposed site boundary.*

See Table X-4 for the names and addresses of noise-sensitive properties and Figure X-3 for noise-sensitive areas within one mile of the proposed Site Boundary.

Table X-4. Noise-Sensitive Properties Within One Mile of the Site Boundary

Tax Lot ID No.	Parcel No.	Land Use	Owner 1	Owner 2	Owner 3	Street Address	City	Zip Code	Total Acreage	Zoning
24S13W35CTL0230100	2301	Residential - Improved	Carlton, Donald J.			93493 Sunset Ln	North Bend	97459	1.18	RR-2
24S13W35CTL0240000	2400	Mh Site W/ Or W/O Imp	Fisher, Lynn E.			93454 Sunset Ln	North Bend	97459	0.48	RR-2
24S13W35CTL0260000	2600	Residential - Improved	Green, Gary A.			93482 Sunset Ln	North Bend	97459	0.64	RR-2
24S13W35CTL0270000	2700	Residential - Improved	Shortridge, Lloyd W. & Beverly			93494 Sunset Ln	North Bend	97459	0.60	RR-2
24S13W35CTL0290000	2900	Residential - Improved	Devine, Delos & Laura J.			65755 North Bay Rd	North Bend	97459	3.50	RR-2
24S13W35CTL0300000	3000	Residential - Improved	Oliva, George J.; Etal			65727 North Bay Rd	North Bend	97459	3.23	R-2
24S13W35CTL0320000	3200	Residential - Improved	Willsey, Kenneth			93420 Willsey Ln	North Bend	97459	1.04	RR-2
24S13W35CTL0330000	3300	Multi For Reporting Only	Brown, Marsha S.			93404 Willsey Ln	North Bend	97459	1.35	RR-2
24S13W35CTL0330100	3301	Residential - Unimproved	Willsey, Kenneth			93418 Willsey Ln	North Bend	97459	2.77	RR-2
24S13W35CTL0340000	3400	Residential - Improved	Schaal, Karen			93413 Karen Ln	North Bend	97459	1.01	RR-2
24S13W35CTL0350000	3500	Residential - Improved	Willsey, Kenneth			93414 Karen Ln	North Bend	97459	0.47	RR-2
24S13W35CTL0360000	3600	Residential - Unimproved	Schaal, Karen					0	0.15	RR-2
25S13W02BATL0090000	900	Residential - Improved	Shimotakahara, Eva E. & Steven G.			66697 Oriole Rd	North Bend	97459	1.99	RR-2
25S13W02BBTL0010200	102	Residential - Improved	James M. Wahl & Katheryn L. Newhouse Tru		Wahl, James & Newhouse, Kathryn; Trustee	66698 Oriole Rd	North Bend	97459	2.07	RR-2
25S13W02BBTL0020000	200	Residential - Unimproved	Shimotakahara, Eva E.					0	0.91	RR-2
25S13W02BBTL0040000	400	Residential - Improved	Blanusa, Petar			66658 Hummingbird Rd	North Bend	97459	0.43	RR-2
25S13W02BBTL0050000	500	Residential - Improved	Mack Mcnally Trust		Mcnally, Mack, Ttee	66678 Hummingbird Rd	North Bend	97459	0.62	RR-2
25S13W02BBTL0060000	600	Residential - Improved	Baumgarten, Herbert & J.O.			66681 Hummingbird Rd	North Bend	97459	0.45	RR-2
25S13W02BBTL0080000	800	Residential - Improved	Aldrich, Hildegard			66634 Glasgow Ln	North Bend	97459	2.03	RR-2
25S13W02BBTL0100000	1000	Residential - Improved	Moe, Alan D. & Carol J.			66636 Glasgow Ln	North Bend	97459	1.39	RR-2
25S13W02BBTL0110000	1100	Residential - Unimproved	Meincke, Scott L.; Etal					0	0.41	RR-2
25S13W02BBTL0120000	1200	Residential - Improved	Bach, Terrance S.			66629 Glasgow Ln	North Bend	97459	2.42	RR-2
25S13W02BBTL0130000	1300	Residential - Unimproved	Shimotakahara, Eva E. & Steven G.					0	0.26	RR-2
25S13W02BBTL0140000	1400	Residential - Improved	Parrish, Lanny H. & Darlene F.			66642 Oriole Rd	North Bend	97459	1.78	RR-2
25S13W02BBTL0150000	1500	Residential - Improved	Bailey, Lynn R.			66636 Oriole Rd	North Bend	97459	0.45	RR-2
25S13W02BBTL0160000	1600	Mh Site W/ Or W/O Imp	Handlos, Gerry F. & Linda L.			67677 East Bay Rd	North Bend	97459	0.35	RR-2
25S13W02BBTL0170000	1700	Residential - Improved	Stuart, Carlyle; Etal			67679 East Bay Rd	North Bend	97459	0.95	RR-2
25S13W02BBTL0180000	1800	Residential - Unimproved	Meincke, Scott L.; Etal					0	0.67	RR-2
25S13W02BTL0090000	900	Residential - Improved	Handlos, Linda; Etal			67684 East Bay Rd	North Bend	97459	1.33	RR-2*
25S13W02BTL0100000	1000	Residential - Improved	Clarke, Frederick W. & Lyn			67694 East Bay Rd	North Bend	97459	1.40	RR-2
25S13W02BTL0110000	1100	Residential - Improved	Joan Todd Survivor's Trust; Et Al		Todd, Joan L.; Trustee	67702 East Bay Rd	North Bend	97459	4.99	RR-2*
25S13W02BTL0120000	1200	Residential - Improved	Howell, John & Anita			67724 East Bay Rd	North Bend	97459	1.47	RR-2*
25S13W09CDTL0010000	100	Residential - Improved	Beaudry, William; Etal			2825 Colorado	North Bend	97459	0.00	R-6
25S13W09CDTL0020000	200	Residential - Improved	Brandt, Betty J.			1520 Lincoln	North Bend	97459	0.00	R-6
25S13W09CDTL0100000	1000	Residential - Improved	Toney, Christopher M. & Jana L.			1575 Johnson	North Bend	97459	0.00	R-6
25S13W09CDTL0110000	1100	Residential - Improved	Beam, Gerald G. & Mary R.			1543 Johnson	North Bend	97459	0.00	R-6

Table X-4. Noise-Sensitive Properties Within One Mile of the Site Boundary

Tax Lot ID No.	Parcel No.	Land Use	Owner 1	Owner 2	Owner 3	Street Address	City	Zip Code	Total Acreage	Zoning
25S13W09CDTL0120000	1200	Residential - Improved	Davidson, Frances M.			1525 Johnson	North Bend	97459	0.00	R-6
25S13W09CDTL0130000	1300	Residential - Improved	Yount, Stephen Gale			1507 Johnson	North Bend	97459	0.00	R-6
25S13W09CDTL0140000	1400	Residential - Improved	Wenbourne, Jacob R. & Sylvia D.			2925 Colorado	North Bend	97459	0.00	R-6
25S13W09CDTL0150000	1500	Residential - Improved	Timm, David R. & Tami L.			1532 Johnson	North Bend	97459	0.00	R-6
25S13W09CDTL0160000	1600	Residential - Improved	Gonzales, Manuel & Janice			1540 Johnson	North Bend	97459	0.14	R-6
25S13W09CDTL0170000	1700	Residential - Improved	Sullivan, Carol R.			1574 Johnson	North Bend	97459	0.00	R-6
25S13W09CDTL0180000	1800	Residential - Improved	Rich, James L.; Etal			1586 Johnson	North Bend	97459	0.00	R-6
25S13W09CDTL0200000	2000	Residential - Improved	Zhen, Bruce J.			1585 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0210000	2100	Residential - Improved	Rominek, Tonya			1575 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0220000	2200	Residential - Improved	Mccay, Lila P.			1555 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0230000	2300	Residential - Improved	Bailey, Harold			1541 Grant	North Bend	97459	0.14	R-6
25S13W09CDTL0240000	2400	Residential - Improved	Commiskey, Charles			1533 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0250000	2500	Residential - Improved	Lux, Jemima			2975 Colorado	North Bend	97459	0.00	R-6
25S13W09CDTL0260000	2600	Residential - Improved	Wagoner/Wolfe Loving Trust	Wolfe, Andrew F., Trustee; Etal		3023 Colorado	North Bend	97459	0.00	R-6
25S13W09CDTL0270000	2700	Multi For Reporting Only	Boyer, Donald A. & Diane L.			1524 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0280000	2800	Residential - Improved	Landers, Claudia A.			1548 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0290000	2900	Residential - Improved	Prowell, Darlene			1560 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0300000	3000	Residential - Improved	Drehmer, Victoria A.			1572 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL0310000	3100	Residential - Improved	Brady, Debra S.			1594 Grant	North Bend	97459	0.21	R-6
25S13W09CDTL0320000	3200	Residential - Improved	Stillion, Jerry L. & Sharon B.			1595 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0330000	3300	Residential - Improved	Pennington, Angeline C.			1593 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0340000	3400	Residential - Improved	Nelson, Lisa L.			1577 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0350000	3500	Residential - Improved	Sutton, Arthur K. & Laura L.			1557 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0360000	3600	Residential - Improved	Coughlin, Mary C.			1545 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0370000	3700	Residential - Improved	Draper, Robert G. & Nancy Y.			1529 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0380000	3800	Residential - Improved	Burbank, Nathan E. & Pam			1509 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0390000	3900	Residential - Improved	Ball, Norman D.; Etal			1510 Hayes	North Bend	97459	0.22	R-6
25S13W09CDTL0400000	4000	Residential - Improved	Goode, Ernest L., Ii & Rhonda R.			1522 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0410000	4100	Residential - Improved	Jackson, Traci A.			1540 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0420000	4200	Residential - Improved	Wagoner, Russell L.			1560 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0430000	4300	Residential - Improved	Brown, Jimmy D. & Edith L.			1570 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0440000	4400	Residential - Improved	Martin, Dean			1590 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0450000	4500	Residential - Improved	Clark, Terry L.			1595 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0460000	4600	Residential - Improved	Beason, Sharon D.			1575 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0470000	4700	Residential - Improved	Freeman Joint Trust	Freeman, Quincy & Diane, Trustees		1555 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0480000	4800	Residential - Improved	Shearer, Richard B.; Etal			1535 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0490000	4900	Residential - Improved	Tankersley, Patricia J.			1515 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0500000	5000	Residential - Improved	Lansbery, Wayne W.			1505 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0510000	5100	Residential - Improved	Wickham, Perry B. & Sofia			1510 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0520000	5200	Residential - Improved	Robert Hendriks Living Trust	Hendriks, Robert, Trustee		1520 Garfield St	North Bend	97459	0.14	R-6

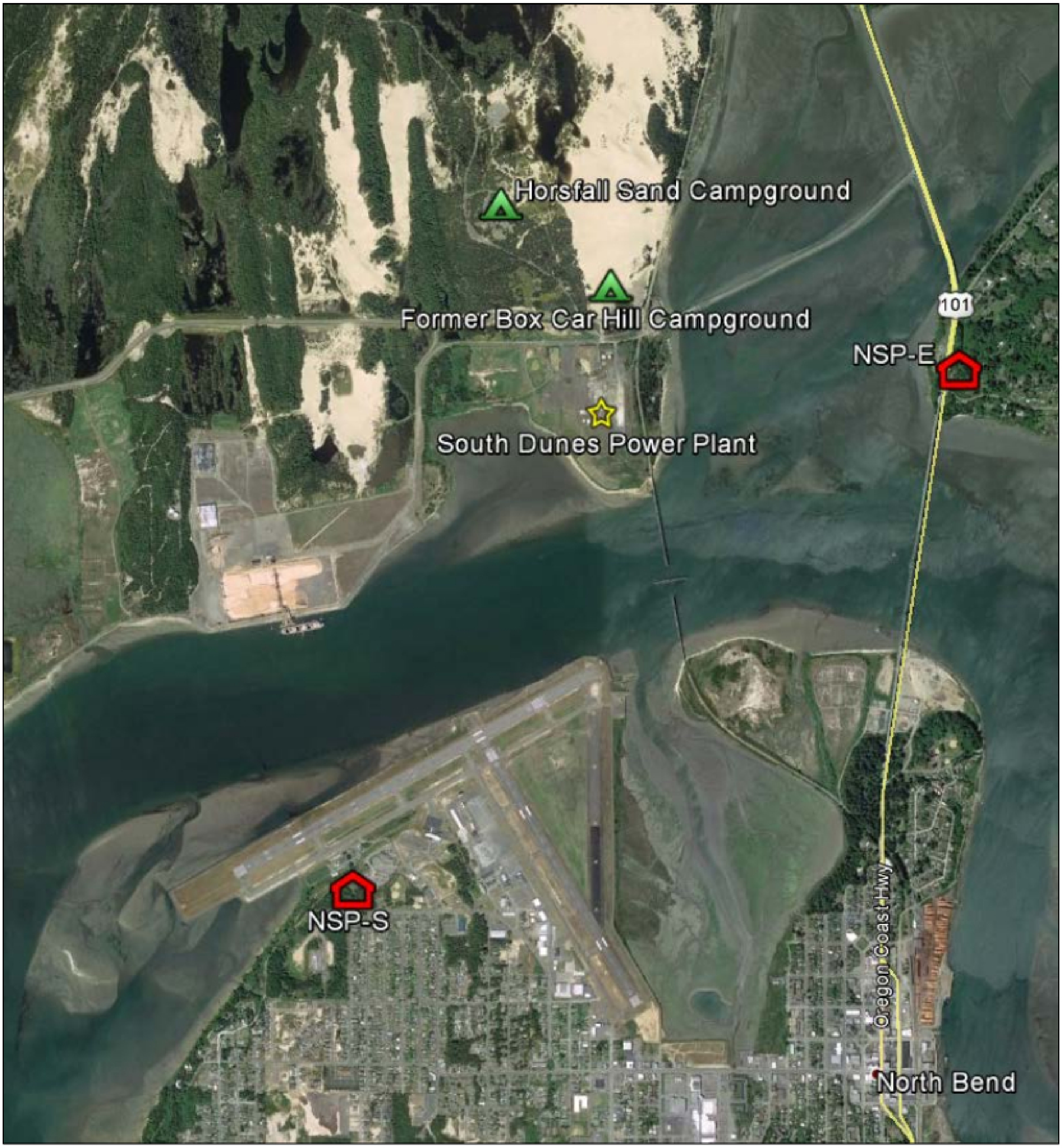
Table X-4. Noise-Sensitive Properties Within One Mile of the Site Boundary

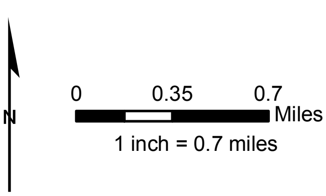
Tax Lot ID No.	Parcel No.	Land Use	Owner 1	Owner 2	Owner 3	Street Address	City	Zip Code	Total Acreage	Zoning
25S13W09CDTL0530000	5300	Residential - Improved	Christine C. Little Living Trust	Little, Christine C., Trustee		1540 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0540000	5400	Residential - Improved	Lucas, Connie M.			1560 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0550000	5500	Residential - Improved	Vanderpool, Brenda J.			1580 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0560000	5600	Residential - Improved	Savery, Ronald J. & Louise R.			1590 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0570000	5700	Residential - Improved	Gile, Ralph & Mary J.			1595 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0580000	5800	Residential - Improved	Canup, David A. & Peggy L.			1587 Arthur	North Bend	97459	0.16	R-6
25S13W09CDTL0590000	5900	Residential - Improved	Rupe, Derrell D. & Alena M.			1569 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0600000	6000	Residential - Improved	German, Louis & Ethel			1547 Arthur	North Bend	97459	0.14	R-6
25S13W09CDTL0610000	6100	Multi For Reporting Only	Porter, Darin & Melissa			1503 Arthur	North Bend	97459	0.21	R-6
25S13W09CDTL0620000	6200	Residential - Improved	Gammon, Harold P. & Janet L.			3295 Colorado	North Bend	97459	0.00	R-6
25S13W09CDTL0630000	6300	Residential - Improved	Mead, Matthew R.			1601 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0640000	6400	Residential - Improved	Robinson, Mary & Li, Kimman			1611 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0650000	6500	Residential - Improved	Mcdonald, Terry & Rose			1617 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0660000	6600	Multi For Reporting Only	Williams, David M. & Joanne A.			1635 Arthur	North Bend	97459	0.66	R-6
25S13W09CDTL0670000	6700	Residential - Improved	Cranmer, Patricia A.; Etal			1669 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0680000	6800	Residential - Improved	Meynink, John P., Jr.; Etal			1681 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0690000	6900	Residential - Improved	Duke, Jack L. & Mildred L.			1695 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0700000	7000	Residential - Improved	Johnson, Michael D. & Shelly L.			1701 Arthur	North Bend	97459	0.00	R-6
25S13W09CDTL0710000	7100	Residential - Improved	Holmes, Betty M.; Etal			1690 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0720000	7200	Residential - Improved	Richards, Darliss N.; Etal			1680 Garfield St	North Bend	97459	0.14	R-6
25S13W09CDTL0730000	7300	Residential - Improved	Montgomery, Deborah Ann			1670 Garfield St	North Bend	97459	0.14	R-6
25S13W09CDTL0740000	7400	Residential - Improved	Teherantchi, Firouzeh P.			1650 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0750000	7500	Residential - Improved	Johnson, Janice J.			1630 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0760000	7600	Residential - Improved	Zinsmeister, Eric			1616 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0770000	7700	Residential - Improved	Green, Jefferey			1610 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0780000	7800	Residential - Improved	White, William & Ruby			1605 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0790000	7900	Residential - Improved	Watson, Kelli			1621 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0800000	8000	Residential - Improved	Burke, Earl S., Jr. & Gale M.			1635 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0810000	8100	Residential - Improved	Cook, Lorry L.			1655 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0820000	8200	Residential - Improved	Cordova, Bevallin D. & Lori			1675 Garfield St	North Bend	97459	0.00	R-6
25S13W09CDTL0880000	8800	Residential - Improved	Weidman, Lee; Etal			1652 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0890000	8900	Residential - Improved	Meksch, Bobby S. & Phyllis G.			1640 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0900000	9000	Residential - Improved	Fransen, Gary L. & Terri J.			1626 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0910000	9100	Residential - Improved	Trust Of Charlotte D. Place		Echelberger, Charlotte D.; Ttee	1612 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0920000	9200	Residential - Improved	Lorenz, Lloyd D. & Nhumai T.			1615 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL0930000	9300	Residential - Improved	Miller, Harold & Marlene L.			1625 Hayes	North Bend	97459	0.00	R-6
25S13W09CDTL1040000	10400	Residential - Improved	Howell, Ashley H.			1620 Grant	North Bend	97459	0.00	R-6
25S13W09CDTL1050000	10500	Residential - Improved	Meincke, Robert A. & Jessica M.			1600 Grant	North Bend	97459	0.00	R-6
25S13W17AATL0010000	100	Residential - Improved	Mason, Christine; Et Al			1678 Maxwell Rd	Coos Bay	97420	0.33	R-2
25S13W17AATL0250000	2500	Residential - Unimproved	Stonecypher Revocable Trust	Stonecypher, Joseph L., Trustee				0	0.49	R-2

Table X-4. Noise-Sensitive Properties Within One Mile of the Site Boundary

Tax Lot ID No.	Parcel No.	Land Use	Owner 1	Owner 2	Owner 3	Street Address	City	Zip Code	Total Acreage	Zoning
25S13W17AATL0260000	2600	Residential - Improved	Ekholm, Jarvis D.			1875 Seagate	Coos Bay	97420	0.61	R-2
25S13W17AATL0400000	4000	Residential - Unimproved	Guirado, Yesi					0	0.47	R-W
24S13W34CTL0140000	1400	Commercial Land - Improved	Parker, Douglas A.	Revocable Living Trust		92851 Transpacific Pkwy	North Bend	97459	NA	REC
24S13W33TL0010000	100	Miscellaneous - Horsfall Sand Campground	U.S.A.			68028 Horsfall Rd	North Bend	97459	637.40	REC

Figure X-1. SDPP Site, Vicinity, and Nearest Noise-Sensitive Properties (NSP)





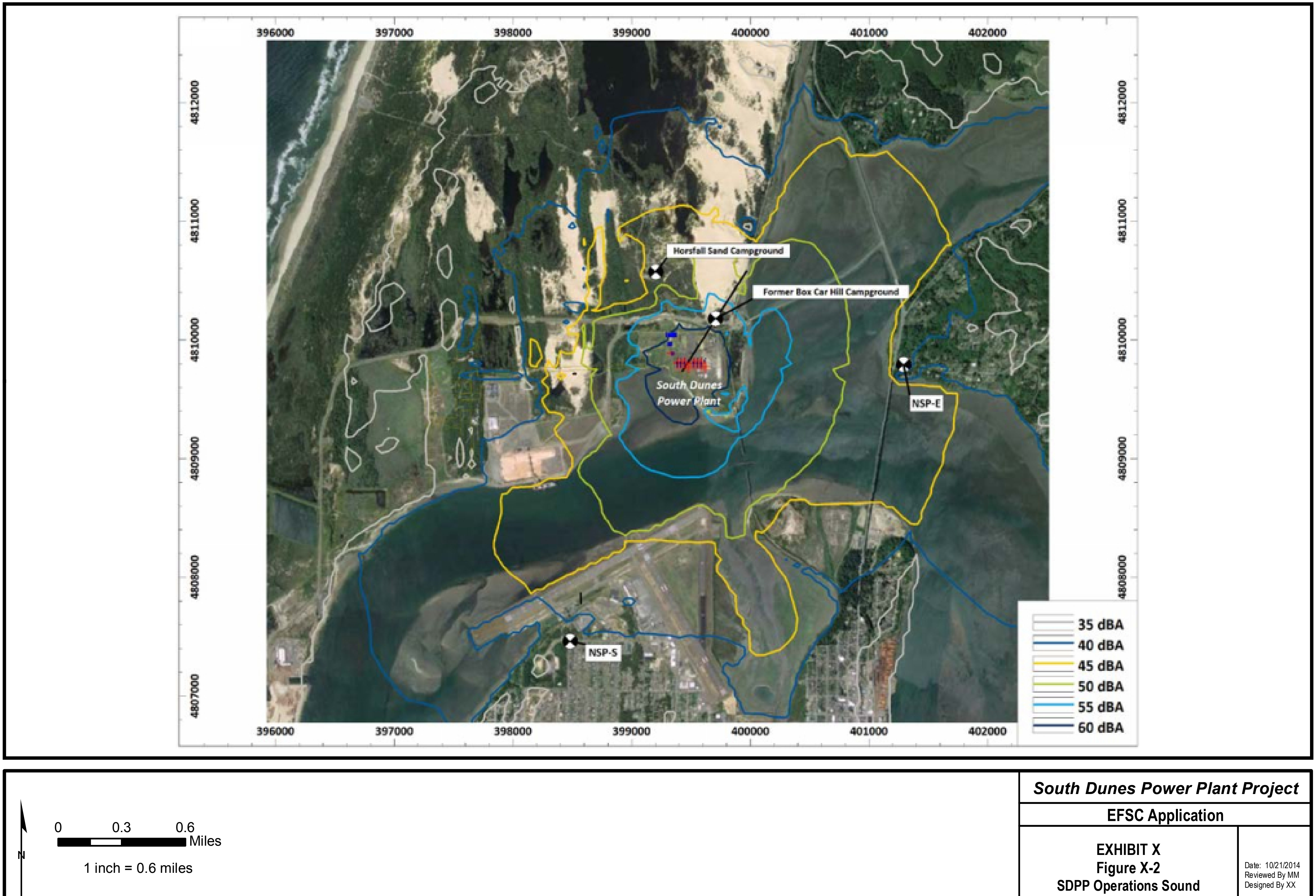
South Dunes Power Plant Project

EFSC Application

EXHIBIT X
Figure X-1
SDPP Site, Vicinity, and Nearest Noise Sensitive Properties (NSP)

Date: 10/21/2014
Reviewed By MM
Designed By XX

Figure X-2. SDPP Operations Sound Level Contours (dBA)



1 inch = 0.6 miles

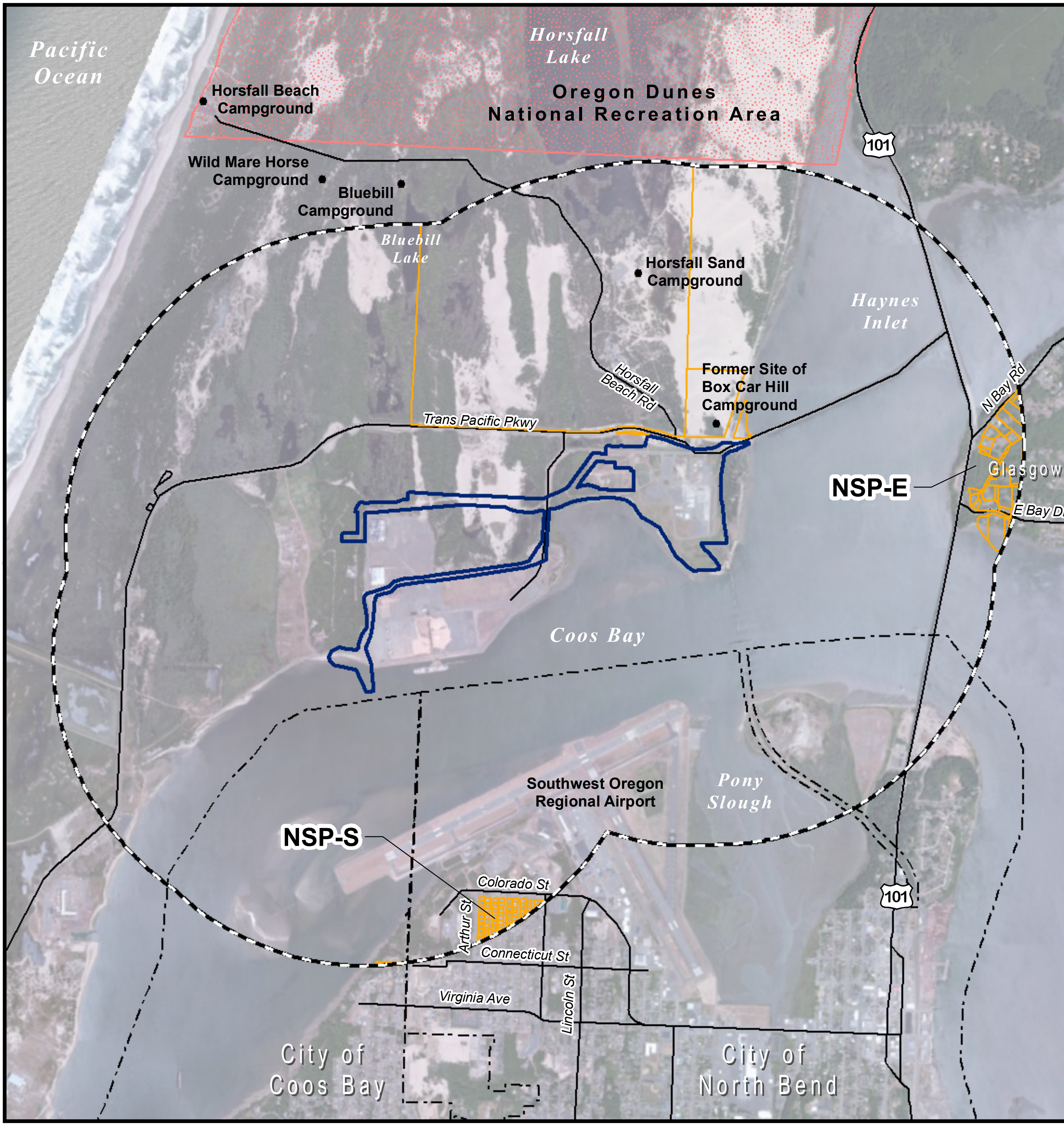
South Dunes Power Plant Project

EFSC Application

EXHIBIT X
Figure X-2
SDPP Operations Sound Level Contours (dBA)

Date: 10/21/2014
Reviewed By MM
Designed By XX

Figure X-3. Noise-Sensitive Properties Within One Mile of the Site Boundary



0 0.25 0.5 Miles

1 inch = 0.5 miles

N

Data Source: Coos County Assessor via ArcGIS Online. Downloaded November 2013.

- EFSC Site Boundary
- Analysis Area (1 mile buffer from EFSC Site Boundary)
- Improved Residential or Campground Parcel
- Oregon Dunes NRA
- City Limits

South Dunes Power Plant Project

EFSC Application

EXHIBIT X
Figure X-3
Noise Sensitive Properties

Date: 9/22/2014
Reviewed By PS
Designed By SAST

APPENDIX X-1

Resource Report 9, Section 9.2.1.2, Ambient Noise Survey

JCEP LNG TERMINAL PROJECT

Resource Report 9 – Air and Noise Quality

To Verify Compliance with this Minimum FERC Filing Requirement:	See the Following Resource Report Section:
1. Describe the existing air quality, including background levels of nitrogen dioxide and other criteria pollutants that may be emitted above EPA-identified significance levels. (§ 380.12(k)(1))	Section 9.1.3
2. Quantitatively describe existing noise levels at noise-sensitive areas such as schools, hospitals, or residences and include any areas covered by relevant state or local noise ordinances: • Report existing noise levels as the Leq (day), Leq (night), and Ldn and include the basis for the data or estimates. • For existing compressor stations, include the results of a sound level survey at the site property line and nearby noise-sensitive areas while the compressors are operated at full load. • For proposed new compressor station sites, measure or estimate the existing ambient sound environment based on current land uses and activities. • Include a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement. (§ 380.12(k)(2))	Section 9.2.1 Figure 9.2-1, 9.2-2, 9.2-3, 9.2-4, and 9.2-5
3. Estimate the impact of the project on air quality, including how existing regulatory standards would be met. • Provide the emission rate of nitrogen oxides from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rates, and annual hours of operation. • For major sources of air emissions (as defined by the Environmental Protection Agency), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations.	Section 9.3.1 Table 9.1-4 and 9.1-5 Table 9.3-1, 9.3-2 and 9.3-4 Appendix B.9
4. Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emission control systems, installation of filters, mufflers, or insulation of piping and buildings, and orientation of equipment away from noise-sensitive areas.	Section 9.3.1 Section 9.3.2

RESOURCE REPORT 9
AIR AND NOISE QUALITY

CONTENTS

RESOURCE REPORT 9
AIR AND NOISE QUALITY

CONTENTS (Continued)

9.1.1.1 Ambient Noise Survey - 2005

Noise levels at both NSA locations were measured continuously between 1700 hours on August 31, 2005, and 1700 hours on September 1, 2005. Measurements were made using Larson-Davis Laboratories Model 820 precision integrating sound level meters. The microphones were placed at a height of about 4.5 feet above the ground and were fitted with foam windscreens to reduce wind-generated noise. Charts of the data are provided in Figures 9.2-2 and 9.2-3 and tabular data are included in Table 9.2-1. Each figure contains two charts of the measured data presented at 1-minute and 1-hour resolutions, respectively. The 1-minute data chart at the top of each figure shows a much greater variation due to the high noise level recorded during a car or truck passage and the relative quiet between vehicles. These large variations are averaged out in the 1-hour data that is used to compute the L_{dn} levels. L_{dn} levels at the NSAs ranged from 53.7 dBA at NSA 1 to 65.7 dBA at NSA 2.

Weather conditions were cool ranging from 55 to 64 °F and winds were light ranging from calm to about 8 mph from the northwest. Skies were clear during the day and a heavy layer of fog blanketed the area at night. No precipitation occurred during the noise survey.

At NSA 1 at the corner of Colorado Avenue and Arthur Street in a subdivision on the south side of Coos Bay, hourly L_{eq} levels ranged from 35.1 dBA between 3 and 4 a.m. to a high of 53.8 dBA between 6 and 7 p.m. (Figure 9.2-2). The calculated L_{dn} level was 53.7 dBA. Sources of noise heard were infrequent local traffic in the subdivision, mostly during the day, and the ocean surf at night.

At NSA 2 on East Bay Street about 200 feet east of US 101, levels were significantly higher due to the increased traffic on US 101. These levels ranged from 48.7 dBA between 1 and 2 a.m. to 66.4 dBA between 9 and 10 a.m. (Figure 9.2-3) The computed L_{dn} was 65.7 dBA.

9.1.1.2 Current Ambient Noise Survey - 2013

Jordan Cove conducted an updated noise monitoring program at the same NSA locations where noise monitoring was conducted in 2005. This updated noise monitoring program was conducted in accordance with OAR 340-035-0035. The nearest NSAs are single-family residences in a subdivision about 1.4 miles south of the Project site in the City of North Bend along the south side of Coos Bay (NSA 1). The subdivision is bordered on the north by Colorado Avenue and on the west by Arthur Street. The nearest NSAs to the east (NSA 2) are also single-family residences about 2.3 miles east on Russell Point. Both NSAs are shown on Figure 9.2-1.

Noise levels at both NSA locations were measured continuously between 1000 hours on April 11, 2013, and 0900 hours on April 18, 2013. The meter located at NSA 2 malfunctioned in the early hours of April 15, 2013, but measured data recorded before that time were deemed accurate. Measurements were made using RION NL-31 and NL-21 precision integrating sound level meters at NSAs 1 and 2, respectively. The microphones were placed at a height of about 5 feet above the ground and were fitted with foam windscreens to reduce wind-generated noise.

Weather conditions were cool ranging from 37 to 55 °F and winds were light ranging from calm to about 10 mph. Some periods of higher wind gusts occurred. Sky cover ranged from clear to overcast. A significant precipitation event occurred in the morning hours of April 15, 2013. Data collected during these hours were removed from the analysis.

Charts of the measured data are provided in Figures 9.2-4 and 9.2-5 and tabular data are included in Tables 9.2-2 and 9.2-3. Each figure contains two charts of the measured data presented at 10-minute and 1-hour resolutions, respectively. The 10-minute data chart at the top of each figure shows a much greater variation due to the high noise level recorded during vehicular traffic passage and the relative quiet between vehicles. These large variations are averaged out in the 1-hour data that is used to compute the L_{dn} levels.

At NSA 1 at the corner of Colorado Avenue and Arthur Street in a subdivision on the south side of Coos Bay, hourly L_{eq} levels ranged from 31.9 dBA to a high of 57.6 dBA. The calculated L_{dn} levels ranged from 47.4 to 51.6 dBA. Sources of noise heard were infrequent local traffic in the subdivision as well as industrial and construction noise, mostly during the day, and the ocean surf at night.

At NSA 2 on East Bay Street about 200 feet east of US 101, levels were significantly higher due to vehicular traffic on US 101. Also audible was distant industrial and construction noise. Measured hourly noise levels ranged from 42.6 dBA to a high of 63.7 dBA. The calculated L_{dn} levels ranged from 59.8 to 62.2 dBA.

In addition to the continuous monitoring, two additional locations were chosen for short term (5 minute) daytime measurements, one within the Oregon Dunes National Recreation Area and one at the BLM boat launch ramp. These locations were chosen in order to determine ambient sound levels at local recreation areas in proximity to the Project, and included the Boxcar Campground to the north and the boat launching area to the southwest. Both locations are shown on Figure 9.2-1.

Existing sounds in the area include traffic, distant industrial and construction noise, occasional recreational vehicle use, boat traffic in Coos Bay, and natural sounds such as birds. These short term measurements were made using a RION NA-27 precision integrating sound level meter. Measurements at these locations were taken on April 11, 17 and 18, 2013, and the sound levels are presented in Table 9.2-4. A review of Table 9.2-4 shows that measured sound levels at the campgrounds ranged from 55.3 to 59.9 dBA, and sound levels at the boat launch parking lot ranged from 40.8 to 47.6 dBA. The higher sound levels measured at the campground are due to frequent truck traffic on Horsfall Road.

In summary, there are no NSAs within one mile of the acoustic center of the Project site. This is a significant buffer that should significantly reduce the potential for any noise impacts. Noise levels at existing NSAs nearest the Project site are controlled primarily by vehicular traffic. Noise levels experienced at the NSAs are similar in level to those in suburban areas where traffic is the primary source of noise.

Jordan Cove Energy Project, L.P.

Figure 9.2-1
Noise Survey Monitoring Points

JCEP LNG Terminal Project

0 500 1,000 2,000 Ft
1:24,000

Source:
ESRI, TRC

Created by: TRC

5/7/2013

EXHIBIT Y
FACILITY CO_2 EMISSIONS
OAR 345-021-0010(1)(Y)

CONTENTS

TABLES

APPENDICES

1.0 INTRODUCTION

OAR 345-021-0010(1)(y). *If the facility is a base load gas plant, a non-base load power plant, or a nongenerating energy facility that emits carbon dioxide, a statement of the means by which applicant elects to comply with the applicable carbon dioxide emissions standard under OAR 345-024-0560, OAR 345-024-0600, or OAR 345-024-0630 and information, showing detailed calculations, about the carbon dioxide emissions of the energy facility. The applicant may present the calculations in tabular form. The applicant shall include the following information and calculations.*

The South Dunes Power Plant (SDPP) would be considered a base load gas plant, as defined in Oregon Administrative Rule (OAR) 345-001-0010(7). As such, and in order for the SDPP to be issued a site certificate, the Energy Facility Siting Council (EFSC) must find that the facility is in compliance with the applicable carbon dioxide emissions standard of 0.675 pounds of carbon dioxide (CO_2) per kilowatt-hour (lb CO_2/kWh) of net electric power output, "with carbon dioxide emissions and net electric power output measured on a new and clean basis," OAR 345-024-0550.

The SDPP may also include power augmentation in the form of duct burning, which would be fueled by natural gas. OAR 345-024-0560 states that base load gas plants designed with power augmentation shall apply the applicable carbon dioxide standard to the incremental emissions. However, carbon dioxide emissions have been conservatively calculated based on the SDPP operating at 100 percent load with duct burners fired year round (8,760 hours per year). Therefore, because power augmentation is being considered as the base load in this scenario, the incremental approach was not used. Rather, the carbon dioxide emissions of the SDPP operating at 100 percent load with continuous duct-firing will be evaluated against the applicable carbon dioxide emissions standard for a base load gas plant of 0.675 lb CO_2/kWh.

The various quantities required to be calculated in this exhibit are included in the following paragraphs, both in the text and in Tables. Detailed calculations including the formulae utilized can be found in Appendix Y-1 to this Exhibit.

2.0 FUEL CYCLE AND USE

OAR 345-021-0010(1)(y)(A). *Fuel cycle and usage including the maximum hourly fuel use at net electrical power output at average annual conditions for a base load gas plant and the maximum hourly fuel use at nominal electric generating capacity for a non-base load power plant or a base load gas plant with power augmentation technologies, as applicable.*

The SDPP would be fueled exclusively by natural gas from two sources: The Pacific Gas Connector Pipeline (approximately 4 percent), and boil-off gas (BOG) and flash gas (approximately 96 percent) from the Jordan Cove Energy Project (JCEP) liquefied natural gas (LNG) facility. The SDPP is a combined cycle electric generating facility consisting of two power blocks. Each power block has a 3X1 configuration (i.e., three combustion turbines (CTs), each equipped with a heat recovery steam generator (HRSG), and one steam turbine generator (STG)). As previously mentioned, for this analysis, calculations were based on the facility operating with power augmentation (i.e., duct firing) continuously on an annual basis (8,760 hours). When power augmentation is used, the SDPP would fire natural gas in both the CT(s) and duct burners in the HRSG. Exhaust gas from the combustion turbines could be heated further by the duct burners if needed. The exhaust gas supplies heat to the HRSG(s), which produce steam that is supplied to the STGs and the gas conditioning facilities for process steam.

Operating at International Organization for Standardization (ISO) standard conditions[1] while utilizing power augmentation, the SDPP is expected to produce a net electrical output of approximately 420 megawatts (MW), with actual output dependent on the technology selected[2]. Assuming 420 MW output at average annual conditions, a fuel heating value of 943 British thermal units per standard cubic foot (Btu/scf[3]), and power augmentation being utilized continuously, the SDPP would use a maximum of approximately 3.6 million standard cubic feet (scf) of natural gas per hour (87 million scf per day).

[1] ISO standard conditions are a dry bulb temperature of 59.0 °F, a relative humidity of 60%, and an atmospheric pressure of 14.7 pounds per square inch absolute (psia).
[2] Exhibit prepared assuming selection of a GE LM6000 PG Sprint combustion turbine. Should the technology change, the application will provide a revised Exhibit Y.
[3] Based on a daily maximum fuel usage of 87 million scf and the total plant heat input of 3418 MBtu/hr including supplemental duct-firing. See Appendix Y-1 for details.

3.0 GROSS CAPACITY FOR EACH GENERATING UNIT

OAR 345-021-0010(1)(y)(B). *The gross capacity as estimated at the generator output terminals for each generating unit. For a base load gas plant, gross capacity is based on the average annual ambient conditions for temperature, barometric pressure, and relative humidity. For a non-base load plant, gross capacity is based on the average temperature, barometric pressure, and relative humidity at the site during the times of year when the facility is intended to operate. For a baseload gas plant with power augmentation, gross capacity in that mode is based on the average temperature, barometric pressure, and relative humidity at the site during the times of year when the facility is intended to operate with power augmentation.*

The precise gross capacity of each generating unit would depend on the final technology selected, although the net capacity will be 420 MW. The gross capacity of each generating unit for a possible technology, with power augmentation, is presented in Table Y-1 and Appendix Y-1.

Table Y-1. Gross Capacity for Each Generating Unit

Generation Unit[1]	Gross Capacity (MW) at Average site conditions with power augmentation[2]
Per Unit Capacity - CTGs (6 each)	56
Per Unit Capacity - STG (2 each)	48.5
Total Plant Gross Capacity	433

[1] Each combustion turbine generator (CTG) and STG at SDPP will be identical.
[2] Capacity is with duct firing. Unfired case was not shown here because it is not examined in this exhibit.

4.0 ON-SITE ELECTRICAL LOADS AND LOSSES

OAR 345-021-0010(1)(y)(C). *A table showing a reasonable estimate of all on-site electrical loads and losses greater than 50 kilowatts, including losses from on-site transformers, plus a factor for incidental loads, that are required for the normal operation of the plant when the plant is at its designed full power operation.*

A list of the anticipated onsite electrical loads and losses greater than 50 kilowatt (kW) with power augmentation is shown in Table Y-2. This list may vary upon detailed project design.

Table Y-2. On-Site Electrical Loads and Losses with Power Augmentation

Unit	Electrical Loads (kW)	Electrical Losses (kW)
Unit 1-6 CTGs	336,000	--
STGs 1 & 2	97,000	--
Boiler Feedwater Pumps	--	3,450
Condensate Pumps	--	400
Condenser Air Extraction	--	160
Air Cooled Condenser Fans	--	2,780
Gas Turbine Auxiliaries	--	2,580
Steam Turbine Auxiliaries	--	600
Economizer Recirculation Pumps	--	90
Direct Current Power Supply and Uninterrupted Power Supply (UPS)	--	90
Lighting	--	180
Miscellaneous Controls and Small Load	--	600
Generator Step Up (GSU) Transformer Losses	--	1,740
Auxiliary Transformer Losses	--	220
Totals	433,000	12,890
Net Electrical Output (kW)	420,110	

5.0 ALTERNATIVE FUEL USE

OAR 345-021-0010(1)(y)(D). *The maximum number of hours per year and energy content (Btu per year, higher heating value) of alternate fuel use.*

Gas Interchangeability is defined as: "The ability to substitute one gaseous fuel for another in a combustion application without materially changing operational safety, efficiency, performance or materially increasing air pollutant emissions."[4] The BOG and flash gas combination that constitutes 96 percent of the fuel used at SDPP meets this definition. Furthermore, according to a gas composition analysis, the BOG and flash gas blend is slightly cleaner than pipeline natural gas. Therefore, since the BOG and flash gas is considered interchangeable with natural gas and is not considered an alternative fuel, this requirement is not applicable.

[4] NGC+ Interchangeability Work Group, February 28, 2005. "White Paper on Natural Gas Interchangeability and Non-Combustion End Use".

6.0 GROSS CARBON DIOXIDE EMISSIONS FOR 30 YEARS

OAR 345-021-0010(1)(y)(E). *The total gross carbon dioxide emissions for 30 years, unless an applicant for a non-base load power plant or nongenerating energy facility proposes to limit operation to a shorter time.*

7.0 CALCULATION OF CARBON DIOXIDE EMISSIONS

The detailed calculations of the SDPP CO_2 emissions, as required by OAR 345-021-0010(y)(E)-(H) are described in this section. The expected emissions and emission factors are provided in Tables Y-3 and Y-4.

The emissions calculations provided herein will be finalized during detailed design or just prior to the start of construction to determine the requisite monetary path offset funds.

As defined in ORS 469.503(2)(e), gross CO_2 emissions are the predicted CO_2 emissions of the SDPP measured on a new and clean basis. As shown in Table Y-3, gross CO_2 emissions for 30 years of operation at ISO conditions with power augmentation are estimated to be approximately 51.6 million tons of CO_2.

Table Y-3. CO_2 Emissions SDPP

Gross 30-Year CO_2 Emissions			
Statutory Life of Plant	=	30	years
Annual Average Hours of Operation	=	8760	hours
Heat Content of Fuel Gas	=	943	Btu/scf[1,4]
Efficiency	=	43	%[4]
Stack CO_2 Emissions per Unit (fired)	=	65432	lbs/hr[2]
Stack CH_4 Emissions per Unit (fired)	=	1.3	lbs/hr[3]
Hourly Plant Total CO_2 Emissions (fired)	=	392592	lbs/hr[4]
Annual Plant Total CO_2 Emissions (fired)	=	1.72E+06	tons/year[4]
30 Year Total CO_2 Emissions (fired)	**=**	**5.16E+07**	**tons**[4]

Notes [ ]:
1. Based on a daily maximum fuel usage of 87 million scf and the total plant heat input of 3418 million British thermal units (MBtu)/hr including supplemental duct-firing.
2. Based on performance data for GE LM6000 combined cycle combustion turbine operating at 100% load with supplemental duct-firing at ISO standard conditions using a CO_2 emission factor (which can also be thought of as a conversion factor for natural gas combustion to CO_2 emissions produced).
3. Based on 1.0E-3 kg/MBtu methane (CH_4) emission factor listed in Table C-2 to 40 CFR Part 98.
4. See Appendix Y-1 for detailed calculations.

As can be seen in Table Y-3, per unit stack emissions of methane (CH_4) are 1.3 lbs/hr. This quantity is 0.002 percent of the per unit CO_2 emissions on a mass basis and 0.05 percent of the per unit CO_2 emissions on a CO_2 equivalent (CO_2e) basis[5]. Because CH_4 emissions can be considered negligible when compared to CO_2 emissions and because this exhibit does not require the calculation of CH_4 emissions from the facility, only CO_2 emissions were considered for OAR 345-021-0010(1)(y)(E).

[5] Based on a global warming potential for CH_4 of 25, the CO_2e emission rate would be 32.5 lb/hr. Global warming potential listed in Table A-1 to Subpart A of 40 CFR Part 98 – Global Warming Potentials.

8.0 GROSS CARBON DIOXIDE EMISSIONS RATE

(i) Pounds of carbon dioxide per kilowatt-hour of net electric power output for a base load gas plant, including operation with or without power augmentation, as appropriate, or for a non-base load power plant;

(ii) Pounds of carbon dioxide per horsepower hour for nongenerating facilities for which the output is ordinarily measured in horsepower; or

(iii) A rate comparable to pounds of carbon dioxide per kilowatt-hour of net electric power output for nongenerating facilities other than those measured in horsepower.

The SDPP is a base load gas plant; the gross carbon dioxide emissions rate will be presented as pounds of carbon dioxide per kilowatt-hour of net electric output. Net electric power output is defined under OAR 345-001-0010(37) as "the electric power produced or capacity made available for use. Calculation of net electrical power output subtracts losses from on-site transformers and power used for any on-site electrical loads from gross capacity as measured or estimated at the generator terminals for each generating unit." Based on the on-site electrical loads and losses presented previously in response to Paragraph (C), the net electrical power is approximately 420 MW with power augmentation.

The gross CO2 emissions rate for the SDPP is estimated to be 0.934 pound per kilowatt hour (lb/kWh) with power augmentation, as shown in Table Y-4.

Table Y-4. Gross CO_2 Emissions Rate for the SDPP

Gross CO_2 Emission Rate			
Plant Total CO_2 Emissions (fired)	=	392592	pounds/hour[1]
Net Electric Power	=	420110	kW
CO_2 Emission Rate	**=**	**0.934**	**lbs/kWh**

Notes[ ]:
1. See Table Y-3 and Appendix Y-1.

9.0 EXCESS CARBON DIOXIDE EMISSIONS FOR 30 YEARS

OAR 345-021-0010(1)(y)(G). *The total excess carbon dioxide emissions for 30 years, unless an applicant for a non-base load power plant or a nongenerating energy facility proposes to limit operation to a shorter time.*

As shown in Table Y-5, the total excess CO_2 emissions for 30 years, including continuous power augmentation, at ISO conditions, are estimated to be approximately 14.3 million tons of CO_2.

Table Y-5. Excess CO_2 Emissions SDPP

Total 30-year CO_2 Emissions Excess			
CO_2 Emission Rate	=	0.934	lbs/kWh
Standard	=	0.675	lbs/kWh
Excess of CO_2 Emission Rate	=	0.259	lbs/kWh
Hourly Excess of CO_2 Emissions	=	54.5	tons/hour[1]
Yearly Excess of CO_2 Emissions	=	4.77E+05	tons/year[1]
30 - Year Excess Emissions	**=**	**1.43E+07**	**tons**[1]

Notes[ ]:
1. See Appendix Y-1 for detailed calculations.

10.0 EXCESS CARBON DIOXIDE EMISSIONS RATE

OAR 345-021-0010(1)(y)(H). *The excess carbon dioxide emission rate, using the same measure as required for paragraph (F).*

By subtracting the carbon dioxide emission standard (0.675 lb/kWh) from the gross carbon emission rate provided in Table Y-4 (0.934 lb/kWh), the excess CO_2 emission rate is estimated to be 0.259 lb CO_2/kWh.

11.0 SITE CONDITIONS

OAR 345-021-0010(1)(y)(I). *The average annual site conditions, including temperature, barometric pressure and relative humidity, together with a citation of the source and location of the data collection devices.*

The site conditions included in this scenario were based on the following ISO standard conditions (British Standards Institution (BSI) 3977-2-1997, pg.5/8) and BSI 3214-1989, pg. 6/48)[6].

Temperature	59 degrees Fahrenheit (°F)
Barometric Pressure	14.7 pounds per square inch (psi)
Relative humidity	60 percent

ISO conditions vary slightly from the following average annual site conditions for the JCEP facility. The average annual conditions were obtained from the American Society of Heating, Refrigerating, and Air-Conditioning Engineers' (ASHRAE) Handbook (ASHRAE, 2009). The source of the weather data is a monitoring station located at the Southwest Oregon Regional Airport, about one mile south of the proposed SDPP site.

Temperature	55 °F
Barometric Pressure	14.7 psi
Relative humidity	60 percent

OAR 345-021-0010(1)(y)(J). *For a non-base load power plant (or when using power augmentation), the average temperature, barometric pressure and relative humidity at the site during the times of the year when the facility is intended to operate, together with a citation of the source and location of the data collection devices.*

Calculations were based on continuous annual power augmentation; therefore, the site conditions are the same as listed above.

[6] Performance data for the 100 percent load with power augmentation scenario at ISO conditions were used because this was the only scenario with these operating conditions run at a temperature near that of the average annual conditions at the SDPP site. The performance data were based on startup emissions data provided by GE for the LM6000PG Sprint combustion turbine, which were also based on ISO conditions.

12.0 FUEL INPUT

OAR 345-021-0010(1)(y)(K). *The annual fuel input in British thermal units, higher heating value, to the facility for each type of fuel the facility will use, assuming:*

(i) For a base load gas plant, a 100-% capacity factor on a new and clean basis and the maximum number of hours annually that the applicant proposes to use alternative fuels;

(ii) For a non-base load power plant, the applicant's proposed annual hours of operation on a new and clean basis, the maximum number of hours annually that the applicant proposes to use alternative fuels and, if the calculation is based on an operational life of fewer than 30 years, the proposed operational life of the facility.

(iii) For a nongenerating facility, the reasonably likely operation of the facility based on one year, 5 year, 15-year, and 30-year averages, unless an applicant proposes to limit operation to a shorter time.

As discussed previously in this Exhibit, the SDPP proposes to use natural gas (4 percent pipeline natural gas, 96 percent BOG and flash gas) as the only fuel. Given 8,760 hours of operation per year, the total annual fuel input (with power augmentation) is expected to be 29.9 million MBtu per year higher heating value (HHV) as indicated in Table Y-6 below.

Table Y-6. Annual Fuel Input

Annual Fuel Input			
Total Heat Input of Plant (6 combined cycle combustion turbines [CCCTs)	=	3418	MBtu/hour[1]
Annual Average Hours of Operation	=	8760	hours
Plant Total Annual Fuel Input for Plant	=	2.99E+07	MBtu/year[1]

Notes [ ] :
1. See Appendix Y-1 for detailed calculations.

13.0 HEAT RATE

OAR 345-021-0010(1)(y)(L). *For each type of fuel a base load gas plant or a non-base load power plant will use, the estimated heat rate and capacity of the facility measured on a new and clean basis with no thermal energy to cogeneration, consistent with the data supplied in Exhibit B.*

As shown in Table Y-7, the estimated heat rate, with power augmentation and 100 percent capacity factor, is approximately 8,135 British thermal units per kilowatt hour (Btu/kWh). As discussed previously, this value may be modified upon completion of detailed design and prior to construction.

Table Y-7. Excess CO_2 Emissions SDPP

Estimated Heat Rate[1,2]			
Total Heat Input of Plant (6 CCCTs)	=	3418	MBtu/hour[3]
Net Electric Power	=	420110	kW[4]
Heat Rate	**=**	**8135**	**Btu/kWh[3]**

Notes[ ]:
1. Values based on vendor performance data and applied without the use of a degradation factor. Therefore, values represent the facility on a new and clean basis.
2. Total heat input and net electric power conservatively consider all six units operating at 100% load with duct-firing (i.e., capacity). This differs from response to OAR 345-021-0010(1)(b)(A)(vi)(IV) found in Exhibit B, which considers expected actual operation. However, this is consistent with the output and capacity listed in response to OAR 345-021-0010(1)(b)(A)(vi)(I) found in Exhibit B.
3. See Appendix Y-1 for detailed calculations including formula utilized to calculate heat rate.
4. From Table Y-2.

14.0 NON-GENERATING FACILITY EFFICIENCY AND CAPACITY

OAR 345-021-0010(1)(y)(M). *For each type of fuel a nongenerating energy facility will use, the estimated efficiency and capacity of the facility with no thermal energy to cogeneration.*

This requirement is not applicable.

15.0 COGENERATION TO LOWER CARBON DIOXIDE EMISSIONS

OAR 345-021-0010(1)(y)(N)(i) through (xii). *If the facility provides thermal energy for cogeneration to lower its net carbon dioxide emissions rate, the applicant shall include: [information outlined in subsection (i) through (xii)]*.

The SDPP will provide thermal energy for process use at the JCEP LNG facility's gas conditioning facility and intends to use this thermal energy for cogeneration to lower its net carbon dioxide emissions rate. As such, the information required by OAR 345-021-0010(1)(y)(N)(i) through (xii) is provided in the responses below.

OAR 345-021-0010(1)(y)(N)(i). *The estimated annual useful thermal energy available from the facility for non-electric processes, annual useful thermal energy used by non-electric processes, and annual thermal energy rejected as waste heat.*

The annual useful thermal energy that will be available for non-electric processes and annual thermal energy that will be rejected as waste heat were calculated assuming power augmentation and a 100 percent capacity factor for the combined cycle units at the SDPP. The annual useful thermal energy that will be *used* by non-electric processes is calculated considering the JCEP LNG Plant will be able to use approximately 67 percent of the available useful thermal energy while operating at expected production capacity (expected LNG production capacity was conservatively chosen over the design or 100 percent capacity factor rates so as to not overstate the reduction in CO_2 emissions available from cogeneration and thus understate SDPP's CO_2 obligation). As discussed previously, these values may be modified upon completion of detailed design and prior to construction. These quantities are calculated in Table Y-8.

Table Y-8. Useful Thermal Energy

Useful Thermal Energy [1,2]						
Process Steam						
	P, psia	**T, °F**	**h, Btu/lb**	**W, lb/hr**	**QSteam, MBtu/hr**	
Block 1, HP Process	765	750	1371	115300	158	
Block 2, HP Process	765	750	1371	56500	77	
TOTAL, HP PROCESS STEAM				171800	236	
Block 1, LP Process	65	308	1185	157300	186	
Block 2, LP Process	65	308	1185	60000	71	
TOTAL, LP PROCESS STEAM				217300	257	
Total Process Steam Available to Steam Host		=	493	MBtu/hr		

Estimated Annual Useful Thermal Energy Available for Non-Electric Processes		=	4319073	MBtu/yr		
Annual Useful Thermal Energy Used by Non-Electric Processes (Based on JCEP LNG Plant's ability to use 67% of available steam at normal production capacity)		=	2893779	MBtu/yr		
Steam Thermal Energy Rejected Thru Air Cooled Condenser (ACC)						
Block 1, STG Discharge to ACC	1.03	103	1	1002	188100	189 *
Block 2, STG Discharge to ACC	1.07	104	1	1003	195100	196 *
TOTAL, STG Discharge to ACC					383200	384
Block 1, Condensate Conditions	1.03	103	0	71	188100	13
Block 2, Condensate Conditions	1.07	104	0	72	195100	14
TOTAL, Condensate Conditions					383200	27
TOTAL HEAT REJECTION			357	MBtu/hr		
Annual Thermal Energy Rejected as Waste Heat		=	3126119	MBtu/yr		
* Note assumes STG discharge is 90% quality steam						
Notes [ ] : 1. See Appendix Y-1 for detailed calculations. 2. Inputs based on engineering data.						

OAR 345-021-0010(1)(y)(N)(ii). *For a base load gas plant or non-base load power plant, the estimated net electric output and annual fuel input in British thermal units higher heating value for the facility for each type of fuel the facility will use and the basis of such estimates.*

As provided in the calculations in response to Paragraphs (A), (C) and (K)(i), the SDPP will be fueled exclusively by natural gas. The estimated net electric output of the SDPP is 420 MW and the annual fuel input in BTUs higher heating value is 29.9 million MBtu per year.

OAR 345-021-0010(1)(y)(N)(iii). *A description of the non-electric thermal processes, the names and addresses of the persons intending to use the non-electric thermal energy, and a description and an estimate of the fuel displaced by cogeneration, including supporting assumptions.*

The JCEP LNG facility will receive natural gas from the Pacific Connector Gas Pipeline (PCGP) (i.e., feed gas). The gas will then be conditioned, cooled into a liquid, stored in two LNG storage tanks, and loaded onto LNG carriers for transport.

Useful thermal energy from the SDPP will be used at the JCEP LNG facility in the Amine Reboiler and the Amine Reclaimer, adjacent to the SDPP site and otherwise described together as the "gas conditioning facility," which are each components of the Amine treating process. The Amine treating process removes CO_2 and hydrogen sulfide impurities from the pipeline feed gas prior to conversion to liquid natural gas. The Amine Reboiler will use low-pressure steam (308°F and 65 pounds per square inch absolute [psia]) and the Amine Reclaimer will use high-pressure steam (750°F and 765 psia).

Steam from the SDPP will also be used at the gas conditioning facility to power the Regeneration Heater, which is used in the closed-loop bed regeneration system. The regeneration system aids in the removal of water from the feed gas.

Additional details on the role of useful thermal energy in the LNG process can be found in "Resource Report 1 – *General Project Description*" of the Federal Energy Regulatory Commission Application submitted by JCEP.

The non-electric thermal energy will be used by:

Jordan Cove Energy Project
125 W. Central Avenue, Suite 380
Coos Bay, OR 97420

Were the JCEP LNG facility not designed to utilize useful thermal energy provided by the SDPP, the useful thermal energy supplied by SDPP would need to be replaced. This energy replacement would likely come from a natural gas-fired auxiliary boiler. This hypothetical boiler would require an estimated annual heat input of 3,024,541 MBtu, which equates to 2.73 billion scf of natural gas on an annual basis. This fuel displacement estimate assumes that the LNG facility is running at its expected production capacity (discussed previously). It also assumes an 82 percent efficient boiler, and a heating value of natural gas of 1110 British thermal units/standard cubic feet. Calculations of these estimates are included in Table Y-9.

Table Y-9. Fuel Displaced by Cogeneration

Fuel Displaced By Cogeneration[1,2]		
Boiler Efficiency (HHV)	0.82	Assumed
High Pressure (HP) Feedwater Properties		
P1, psia	825	
*T1, °F	212	
h1, Btu/lb	182	
m1, lb/hour	171800	
HP Steam Properties		
P2, psia	765	
T2, °F	750	
h2, Btu/lb	1371	

LP Feedwater Properties		
P3, psia	100	
*T3, °F	212	
h3, Btu/lb	180	
m3, lb/hr	217300	
LP Steam Properties		
P4, psia	65	
T4, °F	308	
h4, Btu/lb	1185	
Estimated Fuel Displaced (Assuming Full Production Capacity for JCEP LNG Plant)		= 4514240 MBtu/yr
Estimated Fuel Displaced (Assuming Expected Production Capacity for JCEP LNG Plant)		= 3024541 MBtu/yr
*Process steam is condensed at atmospheric pressure and reused.		
Notes [ ]: 1. Values based on engineering estimates. 2. See Appendix Y-1 for detailed calculations.		

OAR 345-021-0010(1)(y)(N)(iv). *A description of the products produced and thermal energy needed for production of the primary products made by the persons intending to use the non-electric thermal energy produced by the proposed facility, supported by fuel use and steam production records or estimates, if the production facility is new.*

Natural gas will be delivered to the JCEP LNG facility by the PCGP. The gas will then be conditioned, cooled into a liquid, stored in two LNG storage tanks and loaded on to LNG carriers at newly constructed marine facilities. Approximately six million metric tons per annum of LNG will be produced by the JCEP LNG facility, using a feed of approximately 0.9 billion standard cubic feet per day of natural gas.

As shown in Table Y-8 in the response to Paragraph (N)(i), the JCEP LNG facility will use 2,893,779 MBtu/yr of thermal energy from the SDPP in the LNG gas conditioning process, assuming the facility operates at its expected production capability. The estimated fuel use that this useful thermal energy will displace is calculated in the response to Paragraph N(iii) and repeated in the response to Paragraph (N)(vi).

OAR 345-021-0010(1)(y)(N)(v). *The efficiency of each boiler that the thermal energy will displace.*

As stated in the response to Paragraph (N)(iii), the assumed efficiency of the boiler is 82 percent.

OAR 345-021-0010(1)(y)(N)(vi). *For each boiler, the annual fossil fuel displaced in million Btu, higher heating value, by type of fuel that will be displaced by the thermal energy.*

As shown in Table Y-9 in the response to Paragraph (N)(iii), 3,024,541 MBtu/yr of natural gas will be displaced by JCEP's utilization of useful thermal energy produced by SDPP. The amount of natural gas displaced in the hypothetical boiler is greater than that which will actually be consumed, because a more efficient process will be used to generate the steam. The cogeneration process generates the steam and power simultaneously. Without cogeneration, a relatively inefficient gas-fired boiler would be needed to generate the steam.

OAR 345-021-0010(1)(y)(N)(vii). *The annual carbon dioxide offset by the cogeneration host, using a rate of 117 pounds of carbon dioxide per million Btu of natural gas fuel (higher heating value) and a rate of 161 pounds of carbon dioxide per million Btu of distillate fuel (higher heating value).*

Considering a rate of 117 pounds of CO_2 per MBtu for natural gas, the cogeneration host will be offsetting 176,936 tons of CO_2 per year, as shown in Table Y-10.

OAR 345-021-0010(1)(y)(N)(viii). *The cumulative carbon dioxide offset by the steam host through the thirtieth year of facility operation, or for a shorter period if an applicant for a nongenerating facility proposes a shorter operational period.*

The cumulative CO_2 offset by the JCEP LNG Plant through the thirtieth year of operation is 5.31 million tons, as shown in Table Y-10.

Table Y-10. CO_2 Offset by Cogeneration

CO_2 Offset by Cogeneration[1]				
Annual CO_2 Offset		=	176,936	tons/year
CO_2 Offset over a 30-year Period		=	5.31 E+06	tons

Notes [ ]:
1. See Appendix Y-1 for detailed calculations.

OAR 345-021-0010(1)(y)(N)(ix). *A copy of the contractual agreement between the applicant and the cogeneration host for the use of the thermal energy.*

Not Applicable. The SDPP and JCEP LNG facility are under the same ownership. If that situation changes, the contract for steam delivery will be filed with the Council.

OAR 345-021-0010(1)(y)(N)(x). *A description of the guarantees of offsets that the applicant shall provide for cogeneration projects, pursuant to OAR 345-024-0560(1) and OAR 345-024-0600(1).*

Because the SDPP and the gas conditioning facility are both owned by the applicant, a guarantee is not appropriate. There is no second party to whom to offer the guarantee.

OAR 345-021-0010(1)(y)(N)(xi). *A proposed monitoring and evaluation plan and an independent verification plan, pursuant to subparagraphs (O)(xix) and O(xx).*

See the response to those rule sections, below.

OAR 345-021-0010(1)(y)(N)(xii). *A copy of the instrument by which the certificate holder will transfer the offsets to the Council for it to hold in trust.*

A document transferring the offset to the Council for it to hold in trust is attached as Appendix Y-2.

OAR 345-021-0010(1)(y)(O)(xix) - *A description of a transparent and replicable methodology for the applicant's monitoring and evaluation plan and for an independent verification plan, including (1) procedures the applicant and the independent entity will employ, (2) how the applicant will assure funds for ongoing monitoring, evaluation and verification, (3) the time frame and frequency over which the applicant will conduct monitoring and evaluation and over which the independent entity will conduct verification, including the frequency of site visits, if applicable, (4) the reporting procedures and guidelines for the plans, and (5) whether the applicant has identified the independent entity that will perform the verification.*

Answered as part of rule (xx), below.

OAR 345-021-0010(1)(y)(O)(xx) - *The monitoring and evaluation plan and the verification plan shall identify the data needs and data quality with regard to accuracy, comparability, completeness and validity. It shall include methodologies to be used for data collection, monitoring, storage, reporting and management, including quality assurance and quality control provisions. It shall provide complete calculations used to calculate and estimate carbon dioxide emissions from activity within the project boundary. It shall show any formulae and assumptions the applicant used to calculate offset project leakage.*

The applicant will measure natural gas input to the SDPP combustion turbines and HRSG duct burners, high pressure and low pressure steam output of the HRSGs, and the high pressure and low pressure steam input to the gas conditioning facility on a continuous basis over the life of the project, which is anticipated to be a minimum of 30 years. Natural gas input to the SDPP combustion turbines and HRSGs will be used to calculate CO_2 emissions from the SDPP combined cycle combustion turbines by applying an emission factor of 117 lbs/MBtu[7]. Steam flow to the gas conditioning processes will be measured at the common header between the SDPP and the LNG gas conditioning facility. High pressure and low pressure steam input to the gas conditioning facility will be used to calculate fuel displacement using the following formula, which, as in the response to Paragraph N(iii) above, assumes that an 82 percent efficient auxiliary boiler would be required to produce the process steam in the absence of the useful thermal energy provided by the SDPP HRSGs:

[7] From OAR 345-021-0010(1)(y)(N)(vii) above.

Where,

$$FD = ((m1*(h2-h1)+m3*(h4-h3))/(\text{Boiler Efficiency} * 10^{6}))*\text{Process Steam Host Hours of Operation}$$

Assumed Boiler Efficiency (HHV)	0.82	Assumed
HP Feedwater Properties		
h1, Btu/lb	182	
m1, lb/hr	Measured value	
HP Steam Properties		
h2, Btu/lb	1371	
LP Feedwater Properties		
h3, Btu/lb	180	
m3, lb/hr	Measured value	
LP Steam Properties		
h4, Btu/lb	1185	

Fuel displaced by cogeneration will then be converted to offset CO_2 emissions using an emission factor of 117 lb/MBtu.

The measured and calculated data will be stored and backed up electronically by the applicant at its administration building on site, and will be reported quarterly to an independent entity, to be selected at least 60 days before SDPP begins operation. If EFSC wishes to have a role in confirming the selection of the independent entity, the applicant will have no objection. Monitored data will be retained by the SDPP for at least five years.

To ensure data quality, the applicant will inspect the monitors on a regular basis to ensure their accuracy and will have the monitors tested annually. The manufacturer's initial testing and calibration by the National Institute of Standards and Technology (NIST) or similar testing authority, and annual testing will be reported to the independent entity.

Additionally, the applicant will monitor the records of the steam input to the gas conditioning facility on a continuous basis and will report any variations from predicted steam input levels to the independent entity in its quarterly reports. It is to be expected that steam delivered to the gas conditioning facility will vary with the level of activity at the LNG liquefaction facility. The applicant will work with the independent entity to develop a reporting system for "upsets" from the normal conditioning process.

The independent entity will be tasked with ensuring that the submitted records are accurate, through periodic audits of the records (at least annually), physical examination of the meters, recording equipment, and other equipment, including ordering of tests, and any other means at its discretion. It shall identify data needs it believes are necessary in addition to those outlined here. It shall report its findings at least semi-annually to the applicant and to the Council at least annually. The independent entity may make site visits at any time and must do so at least annually.

The applicant will submit a copy of its contract with the independent entity to the Council. It will also in each budget cycle make funds available for the independent entity to carry out its duties according to its contract with the applicant, these funds to be secured by surety of an irrevocable letter of credit. The applicant will report annually to the Council the amount budgeted for the independent entity, if that amount is not already set forth in the contract filed with the Council.

Calculations of carbon dioxide emissions within the project boundary are provided in (E), above. While additional emissions may be expected from vehicle traffic to and from the site, these are expected to be insignificant in comparison to those from the SDPP exhaust stacks.

Because of the nature of the gas conditioning facility as a cogeneration project, no leakage is anticipated from the project.

16.0 EMISSIONS OFFSET

OAR 345-021-0010(1)(y)(O)(i) through (xxi). *If the applicant proposes to offset carbon dioxide emissions as described in OAR 345-024-0550 (3), OAR 345-024-0560(2), OAR 345-024-0590(3), OAR 345-024-0600(2), OAR 345-024-0620(3) or OAR 345-024-0630(1), the applicant shall include: [information outlined in subsection (i)through (xxi)].*

The applicant does not propose to offset excess emissions using the provisions in the administrative rules cited above.

OAR 345-021-0010(1)(y)(P). *If the applicant elects to comply with the applicable carbon dioxide emissions standard by using the monetary path under OAR 345-024-0560(3), OAR 345-024-0600(3) or OAR 345-024-0630(2), the applicant shall include:*

(i) A statement of the applicant's election to use the monetary path.

The applicant proposes to comply with the CO_2 standards of OAR 345-024-0550, OAR 345-024-0590, and OAR 345-024-0600 by using the monetary path as allowed by OAR 345-024-0560(3) and OAR 345-024-0600(3) and in compliance with the payment requirement of OAR 345-024-0710.

(ii) The amount of carbon dioxide reduction, in tons, for which the applicant is taking credit by using the monetary path.

As provided in the calculations in response to Paragraph (G), excess CO_2 emissions for the SDPP are 14.3 million tons (see Table Y-5). Considering this total in concert with CO_2 emissions offset through cogeneration (5.3 million tons – Table Y-10), the amount of CO_2 reduction, in tons, for which the SDPP is taking credit by using the monetary path is 9.0 million tons.

(iii) The qualified organization to whom the applicant will provide offset funds and funds for the cost of selecting and contracting for offsets. The applicant shall include evidence that the organization meets the definition of a qualified organization under OAR 345-001-0010. The applicant may identify an organization that has applied for, but has not received, an exemption from federal income taxation, but the Council shall not find that the organization is a qualified organization unless the organization is exempt from federal taxation under section 501(c)(3) of the Internal Revenue Code as amended and in effect on December 31, 1996.

The applicant will provide offset funds, and funds for the cost of selecting and contracting for offsets, to The Climate Trust. The Climate Trust is a "qualified organization" as defined by OAR 345-001-0010(50) for the following reasons:

- The Climate Trust is exempt from federal taxation under section 501(c)(3) of the Internal Revenue Code. By letter dated November 19, 1997, the Internal Revenue Service determined that The Climate Trust (then the Oregon Climate Trust) is exempt from taxation under section 501(c)(3).

- The Climate Trust is incorporated in the State of Oregon. The Articles of Incorporation are filed with the Oregon Secretary of State.
- The Articles of Incorporation of The Climate Trust require that offset funds received under OAR 345-024-0710(3) (ORS 469.503(2)) are to be used for offsets projects that would result in direct reduction, elimination, sequestration, or avoidance of CO_2 emissions. The Articles of Incorporation of The Climate Trust require that decisions regarding the use of such funds be made by a body composed of seven voting members, of which three are appointed by applicants for site certificates that are subject to ORS 469.503(2)(d) and the holders of such site certificates.
- The Climate Trust has made available on an annual basis, beginning after the first year of operation, a signed opinion of an independent certified public accountant stating that the qualified organization's use of funds pursuant to ORS 469.503 conforms to generally accepted accounting principles.
- The Climate Trust has provided the Oregon Department of Energy with documentation that The Climate Trust has complied with OAR 345-001-0010(50)(e) (ORS 469.503(2)(e)(N)(v)).

(iv) A statement of whether the applicant intends to provide a bond or letter of credit to secure the funds it must provide to the qualified organization or whether it requests the option of providing either a bond or a letter of credit.

The applicant proposes to use a letter of credit to ensure the payment of funds to The Climate Trust.

17.0 REFERENCES

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), 2009. *2009 ASHRAE Handbook – Fundamentals (Inch-Pound Edition) 2009 Fundamental Weather Files, North Bend Municipal Airport, Oregon, USA.* ASHRAE: Atlanta, Georgia.

British Standards Institution (BSI). 1998. *Specification for Gas Turbine Acceptance Tests.* Implementing Amendment No. 1 (1998). ISO 2314:1989. BS 3135:1989.

British Standards Institution (BSI). 1997. *Gas Turbines – Procurement – Part 2; Standard Reference Conditions and Ratings.* BS 3977: 1997.

APPENDIX Y-1

Calculations

Jordan Cove Energy Project
South Dunes Power Plant

Appendix Y-1 - **Site Certification - Exhibit Y (OAR 345-021-0010 (1)(y)) Calculations**

OAR 345-021-0010 (1)(y)

Paragraph

(A)

Maximum Hourly Fuel Use (scf/hr)		
CT Heat Input (HHV)	=	544 MBtu/hr[1]
Duct Burner Heat Input (HHV)	=	26 MBtu/hr[1]
Total Heat Input Per Unit (fired)	=	570 MBtu/hr
Total Heat Input of Plant (2 Blocks of 3 Units each) - **(HI_T)**	=	3418 MBtu/hr
Heat Value of Natural Gas - **(HC_{NG})**	=	943 Btu/scf[2]

$$Maximum\ Hourly\ Fuel\ Use = (HIF * 106)/HC_{NG}$$
$$Maximum\ Daily\ Fuel\ Use = Maximum\ Hourly\ Fuel\ Use * 24\ hours$$

Maximum Hourly Fuel Use	=	3.6E+06 scf/hr
Maximum Daily Fuel Use	=	8.70E+07 scf/day

(B)

Gross Capacity (MW)		
Unit 1-6 GTG per Unit Gross Output (MW)	=	56 MW
STG 1 & 2 per Unit Gross Output (MW)	=	48.5 MW
Total CTG Gross Output - 6 CTGs (MW)	=	336 MW
Total STG Gross Output - 2 STGs (MW)	=	97 MW
Total Gross Output of Plant (MW)	=	433 MW

(C)

Net Electrical Output (kW)		
Unit	**Electrical Loads (KW)**	**Electrical Losses (KW)**
Unit 1-6 CTG	336000	--
STGs 1 & 2	97000	--
Boiler Feedwater Pumps	--	3450
Condensate Pumps	--	400
Condenser Air Extraction	--	160
Air Cooled Condenser Fans	--	2780
Gas Turbine Auxiliaries	--	2580
Steam Turbine Auxiliaries	--	600
Economizer Recirculation Pumps	--	90
DC Power Supply and UPS	--	90
Lighting	--	180
Miscellaneous Controls and Small Loads	--	600
GSU Transformer Losses	--	1740
Auxiliary Transformer Losses	--	220
Totals	433000	12890

$$Net\ Electrical\ Output = Electrical\ Loads - Electrical\ Losses$$

Net Electrical Output (kW)	420110

(D)

Alternate Fuel Use
Not Applicable

(E)

30-Year CO_2 Emissions SDPP		
Statutory Life of Plant	=	30 years
Annual Average Hours of Operation	=	8760 hours
Heat Content of Fuel Gas	=	943 Btu/scf[2]

$$Efficiency = \left(\frac{\frac{3414kW}{Btu}}{\left(Total\ Heat\ Input * \frac{10^6}{GrossOutput}\right)}\right) * 100$$

Efficiency	=	43 %	
Stack CO_2 Emissions per Unit (fired)	=	65432 lbs/hr[1]	Performance Data
Stack CH_4 Emissions Per Unit (fired)	=	1.3 lbs/hr[3]	
Hourly Plant Total CO_2 Emissions (fired)	=	392592 lb/hr	

$$Annual\ Plant\ Total\ CO_2\ emissions = (Hourly\ Plant\ Total\ CO_2\ Emissions * 8760\ hrs/yr)/2000\ lbs/ton$$

Annual Plant Total CO_2 Emissions (fired)	=	1.72E+06 tons/year

$$30\ Year\ Total\ CO_2\ emissions = Annual\ Plant\ Total\ CO_2\ Emissions * 30\ years$$

30 Year Total CO_2 Emissions (fired)	=	5.16E+07 tons

(F)(i)

Gross CO_2 Emission Rate (SDPP)		
Plant Total CO_2 Emissions (fired)	=	392592 lbs/hr
Net Electric Power	=	420110 kW

$$CO_2\ Emission\ Rate = Hourly\ Plant\ Total\ CO_2\ Emissions/Net\ Electric\ Power$$

CO_2 Emission Rate	=	0.934 lbs/kWh

(G)

Total 30-year CO_2 Emissions Excess		
CO_2 Emission Rate	=	0.934 lbs/kWh
Standard	=	0.675 lbs/kWh

$$Excess\ of\ CO_2\ Emission\ Rate = CO_2\ Emission\ Rate - Standard$$

Excess of CO_2 Emission Rate	=	0.259 lbs/kWh

$$Hourly\ Excess\ of\ CO_2\ Emissions = (Excess\ of\ CO_2\ Emission\ Rate * Net\ Electric\ Power)/2000\ lbs/ton$$

Hourly Excess of CO_2 Emissions	=	54.5 tons/hr

$$Yeary\ Excess\ of\ CO_2\ Emissions = Hourly\ Excess\ of\ CO_2\ Emissions * 8760\ hrs/yr$$

Yearly Excess of CO_2 Emissions	=	4.77E+05 tons/yr

$$30\text{-}Year\ Excess\ of\ CO_2\ Emissions = Yearly\ Excess\ of\ CO_2\ Emissions * 30\ years$$

30 - Year Excess of CO_2 Emissions	=	1.43E+07 tons

(H)(i)

Excess CO_2 Rate	**=**	**0.259 lbs/KWh**

(I/J)

Site Conditions[4]		
Average Temperature	=	59.0 °F
Barometric Pressure	=	14.7 psia
Relative Humidity	=	60.0 %

(K) (i)

Annual Fuel Input		
Total Heat Input of Plant (6 CCCTs)	=	3418 MBtu/hr
Annual Average Hours of Operation	=	8760 hours

$$Plant\ Total\ Annual\ Fuel\ Input\ for\ Plant = Total\ Heat\ Input\ of\ Plant * 8760\ hrs/yr$$

Plant Total Annual Fuel Input for Plant	=	2.99E+07 MBtu/yr

Appendix Y-1 - **Site Certification - Exhibit Y (OAR 345-021-0010 (1)(y)) Calculations**

OAR 345-021-0010 (1)(y)

(L)

Heat Rate and Capacity			
Total Heat Input of Plant (6 CCCTs)	=	3418	MBtu/hr
Net Electric Power	=	420110	kW
$Heat\ Rate = (Total\ Heat\ Input\ of\ Plant * 106)/Net\ Electric\ Power$			
Heat Rate	=	8135	Btu/kWh

(M)

Heat Rate and Capacity (Non Generating Station)
Not Applicable

(N)(i)

Useful Thermal Energy[5]

Process Steam

	P, psia	T, °F	h, Btu/lb	W, lb/hr	QSteam, MBtu/hr
Block 1, HP Process	765	750	1371	115300	158
Block 2, HP Process	765	750	1371	56500	77
TOTAL, HP PROCESS STEAM				171800	236
Block 1, LP Process	65	308	1185	157300	186
Block 2, LP Process	65	308	1185	60000	71
TOTAL, LP PROCESS STEAM				217300	258

$Total\ Process\ Steam\ Available\ to\ Steam\ Host = Total\ HP\ Process\ Steam + Total\ LP\ Process\ Steam$

Total Process Steam Available to Steam Host	=	493	MBtu/hr

$Available\ UTE = Total\ Process\ Steam\ Available * 8760\ hrs/yr$

Estimated Annual Useful Thermal Energy Available for Non-Electric Processes (**Available UTE**)	=	4319073	MBtu/yr

$Used\ UTE = Available\ UTE * 67\%$

Annual Useful Thermal Energy Used by Non-Electric Processes **(Based on JCEP LNG Plant's ability to use 67% of available steam at expected operating capacity)** (**Used UTE**)	=	2893779	MBtu/yr

Steam Thermal Energy Rejected Thru Air Cooled Condenser (ACC)

$QSteam = (h * W)/10^6$

	P, psia	T, °F	X	h, Btu/lb	W, lb/hr	QSteam, MBtu/hr[6]
Block 1, STG Discharge to ACC	1.03	103	1	1002	188100	189
Block 2, STG Discharge to ACC	1.07	104	1	1003	195100	196

$W_{total} = WBloc_{k1} + WBloc_{k2}$

$QSteam_{total} = QSteamBloc_{k1} + QSteamBloc_{k2}$

	P, psia	T, °F	X	h, Btu/lb	W, lb/hr	QSteam, MBtu/hr
TOTAL, STG Discharge to ACC					383200	384
Block 1, Condensate Conditions	1.03	103	0	71	188100	13
Block 2, Condensate Conditions	1.07	104	0	72	195100	14
TOTAL, Condensate Conditions					383200	27

$Total\ Heat\ Rejection = Total, STG\ Discharge\ to\ ACC - Total, Condensate\ Conditions$

TOTAL HEAT REJECTION		357	MBtu/hr

$Annual\ Thermal\ Energy\ Rejected\ as\ Waste\ Heat = Total\ Heat\ Rejection * 8760\ hrs/yr$

Annual Thermal Energy Rejected as Waste Heat	=	3126119	MBtu/yr

(N)(ii)

Annual Net Electric Power Output and Annual Fuel Input For Natural Gas
See Tables for Paragraphs A, C, and K(i)

(N)(iii)

Fuel Displaced By Cogeneration[7]

Boiler Efficiency (HHV)	0.82	Assumed
HP Feedwater Properties		
P1, psia	825	
T1, °F[9]	212	
h1, Btu/lb	182	
m1, lb/hr	171800	
HP Steam Properties		
P2, psia	765	
T2, °F	750	
h2, Btu/lb	1371	
LP Feedwater Properties		
P3, psia	100	
T3, °F[9]	212	
h3, Btu/lb	180	
m3, lb/hr	217300	
LP Steam Properties		
P4, psia	65	
T4, °F	308	
h4, Btu/lb	1185	

$FD_{Full\ Capacity} = ((m1*(h2-h1)+m3*(h4-h3))/(Boiler\ Efficiency * 10^6))*8760\ hrs/yr$

Estimated Fuel Displaced (Assuming Full Production Capacity for JCEP LNG Plant) $FD_{Full\ Capacity}$	=	4514239.8	MBtu/yr

$FD_{Expected\ Capacity} = FD_{Full\ Capacity} * 67\%$

Estimated Fuel Displaced (Assuming Expected Production Capacity for JCEP LNG Plant) $FD_{Expected\ Capacity}$	=	3024540.7	MBtu/yr

(N)(v, vi)

Efficiency of Displaced Boiler & Fuel Displaced			
Displaced Boiler Efficiency	=	82	%
Estimated Fuel Displaced	=	3024540.7	MBtu/yr

(N)(vii, viii)

CO_2 Offset by Cogeneration

$Annual\ CO_2\ Offset = (117\ lbs\ CO_2/MBtu * FD_{Expected\ Capacity})/2000\ lbs/ton$

Annual CO_2 Offset	=	176936	tons/yr

$CO_2\ Offset\ over\ a\ 30\ year\ period = Annual\ CO_2\ Offset * 30\ years$

CO_2 Offset over a 30 yr Period	=	5.31E+06	tons

(O)

Offset CO_2 Emission
Not Applicable

(P)(ii)

Amount of CO_2 Reduction (SDPP)

$$Net\ 30 - Year\ Excess\ of\ CO2\ Emissions = Total\ 30 - Year\ Excess\ of\ CO2\ Emissions - CO2\ Offset\ over\ a\ 30yr\ Period$$

Net 30 - Year Excess of CO_2 Emissions (SDPP)	=	9.0E+06	tons

Notes [ ]:

1. Based on performance data for LM6000 PG Sprint combustion turbine.
2. Based on daily maximum fuel use of 87 million scf and total plant heat input of 3418 MBtu/hr including supplemental duct-firing.
3. Based on CH_4 emission factor listed in Table C-2 to 40 CFR Part 98 of 1.0E-3 kg/MBtu.
4. Performance data for the 100 percent load with power augmentation scenario at ISO conditions were used because this was the only scenario with these operating conditions run at a temperature near that of the average annual conditions at the SDPP site. The performance data were based on startup emissions data provided by GE for the LM6000PG Sprint combustion turbine, which were also based on ISO conditions.
5. Based on engineering data.
6. Assumes STG discharge is 90% quality steam.
7. Based on engineering estimates.
8. Process steam is condensed at atmospheric pressure and reused.

APPENDIX Y-2

Carbon Offset Transfer Letter

Jordan Cove Energy Project, L.P.

1. Jordan Cove Energy Project (JCEP) is proposing to build a natural gas liquefaction facility and shipping terminal on the North Spit of Coos Bay. At this LNG facility, natural gas will be liquefied, loaded onto specialized ocean-going carriers, and shipped to customers, probably in Asia. The LNG facility will be supplied through a 36" natural gas pipeline from near Malin, Oregon, to Coos Bay (Pacific Connector Gas Pipeline).

2. All power to operate the LNG facility will be generated by the South Dunes Power Plant, a 420 megawatt combined cycle combustion turbine generating plant, fueled by natural gas.

3. JCEP will be the owner of the LNG facility and the South Dunes Power Plant. The pipeline is being built and will be owned by other parties.

4. It is projected that approximately 96% of the fuel for the SDPP will come from boil off gas and flash gas from the LNG facility. The remainder will come directly from the Pacific Connector pipeline.

5. All gas that enters the LNG facility must be treated to remove contaminants (e.g., sulfur compounds, water, CO_2). This treatment will take place at a Gas Conditioning Facility to be located near the main part of the SDPP site.

6. The Gas Conditioning Facility will operate from steam produced by the SDPP steam generators that power the steam turbines that generate part of the electricity produced by the power plant. This steam will be piped to the Gas Conditioning Facility from the SDPP. Because the steam produced by the power plant serves a dual purpose (generating power and serving the Gas Conditioning Facility), the SDPP and the Gas Conditioning Facility can be considered a cogeneration facility.

7. Cogeneration facilities have the potential to produce "carbon offsets," which may have value in future carbon markets.

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8. Although JCEP has no intention of trying to sell its carbon offset from the cogeneration facility, OAR 345-021-0010(1)(y)(N)(xii) requires that an applicant for a cogeneration facility transfer the carbon offset to the Energy Facility Siting Council to be held in trust.

9. Jordan Cove Energy Project hereby transfers the carbon offsets described herein to the Energy Facility Siting Council of Oregon to be held in trust.

10. This instrument is valid until such time as the Site Certificate for the South Dunes Power Plant expires or when the requirement for the carbon offset transfer is repealed or found to be invalid by the Oregon Supreme Court.

11. JCEP will notify the Council of any change of ownership of the SDPP or the Gas Conditioning Facility.

Dated, this 16th day of December

Robert L Braddock

Robert Braddock, Project Manager, Jordan Cover Energy Project

EXHIBIT Z
COOLING TOWER PLUME
OAR 345-021-0010(1)(Z)

OAR 345-021-0010(1)(z). *If the proposed facility has an evaporative cooling tower, information about the cooling tower plume.*

The Jordan Cove Energy Project (JCEP) proposes to dispose of heat from each power block using air-cooled condensers (ACCs) rather than a wet evaporative cooling tower which typically produces condensed water vapor plumes. This method of cooling, with ACCs, does not produce a plume. Conversely, cooling towers operate in an "open loop" system where air flows upward while cooling water flows downward and heat from the water is transferred to the upward flowing air. In the process, some of the cooling water evaporates and exits the cooling tower as warm water-saturated air which condenses in the cooler atmosphere, producing a visible condensed water vapor plume.

Non-plume producing ACCs are often used where water conservation or plume abatement is desirable. Use of this technology eliminates potential hazards to highways or airports that can result if a typical cooling tower is employed.

An ACC is a fin tube and bundle, forced draft heat exchanger. Unlike the open heat transfer mechanism of cooling towers where the fluid being cooled (water) comes into direct contact with the heat transfer medium (air), ACCs use a closed heat transfer mechanism. An ACC is considered a 'dry cooling' method because the motive fluid, steam, is condensed inside the heat exchanger by forcing ambient air over the outside surfaces of the heat exchanger.

Steam is conveyed from the steam turbine to the ACC inside a large duct and then distributed to a series of tube bundles via one or more headers. Steam is condensed inside the tubes at vacuum conditions by heat transfer through the fin tube surfaces to ambient air that is forced through the external fins by fans. The condensed steam is routed to a collection tank via headers before being pumped back into the feedwater-steam cycle.

Heat from the power block is also sent to the gas conditioning facility. The heat transfer is also completed within a closed-loop system and does not create a visible plume.